User's Manual

Workbench6 V1.02.00

Integrated Development Environment for R-touch

User's Manual

Target Device
RX Family
RX Family

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(2012.4)

How to Use This Manual

This manual describes the role of the Workbench6 integrated development environment for developing applications and systems for RH850 family, RX family, and RL78 family, and provides an outline of its features.

Workbench6 is an integrated development environment (IDE) for RH850 family, RX family, and RL78 family, integrating the necessary tools for the development phase of software (e.g. design, implementation, and debugging) into a single platform.

By providing an integrated environment, it is possible to perform all development using just this product, without the need to use many different tools separately.

Readers	This manual is intended for users who wish to understand the functions of the CS+ and design software and hardware application systems.	
Purpose	This manual is intended to give users an understanding of the functions of the CS+ to use for reference in developing the hardware or software of systems using these devices.	
Organization	This manual can be broadly divided into the following units.	
How to Read This Manual	It is assumed that the readers of this manual have general knowledge of electricity, logic circuits, and microcontrollers.	
Conventions	Data significance:	Higher digits on the left and lower digits on the right
	Active low representation:	XXX (overscore over pin or signal name)
	Note:	Footnote for item marked with Note in the text
	Caution:	Information requiring particular attention
	Remarks:	Supplementary information
	Numeric representation:	Decimal ... XXXX Hexadecimal ... 0xXXXX

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Revision Record 3

1. Summary

1.1 System Requirements

System requirements for Workbench are as follows.

Table 1-1Supported OS

OS	Remarks
Windows Vista (32 bit, 64 bit)	
Windows 7 (32 bit, 64 bit)	
Windows 8 (32 bit, 64 bit)	

1.2 Other installation files

1.2.1 Supported Integrated Development Environment

Workbench supports Renesas electronics CS+ and e2 studio.

Table 1-2 Supported Integrated Development Environment

Integrated Development Environment	Version	Remarks
Renesas electronics CS+	V.3.00.00 or later	
Renesas electronics e2 studio	V3.1.0.24 or later	Administrator right is necessary to enable Integration Service.

1.2.2 Run-time library

Workbench needs Visual studio 2012 Run-time library (x86). Even if you use 64 bit OS (e.g. Windows 7 64 bit), Workbench needs Visual studio 2012 Run-time library for 32 bit.

1.2.3 .NET Framework

Workbench needs Microsoft .NET framework 4.0.

2. Window reference

2.1 Main window

This is the start-up window that opens when Workbench is launched. In this window, you can start First step guide and touch sensor monitoring tools, touch sensor tuning tools.

Figure 2-1 Main window

2.1.1 Menu bar

This menu displays menus.

(1) Connection

(a) CS+ connection

Workbench starts connection with target board via CS+. If “Open” dialog is displayed, select a CS+ project file and press [OK] button.

(b) e2 studio connection

Workbench starts connection with target board via e2 studio. If “e2 studio Project / Workspace setup” dialog is displayed, select a e2 studio project folder and e2 studio workspace folder and press [OK] button.

(c) Serial port connection

Workbench starts connection with target board via serial port. If “Setup Serial port” dialog is displayed, select a serial port number connecting your target board and serial port baudrate and press [OK] button.

(d) Disconnection

Workbench ends connection with target board.

(e) Close All

Workbench closes all tools in window area.

(f) Exit

Workbench exits.

(2) View

(a) Tool bar

Shows and hides tool bar.

(a) Status bar

Shows and hides status bar

(3) Capacitive touch

(a) Status monitor

Start Status monitor.

(a) Slider monitor

Start Slider monitor.

(b) Wheel monitor

Start Wheel monitor.

(c) Difference monitor

Start Difference monitor.

(d) Locus monitor

Start Locus monitor.

(e) Measurement view

Start Measurements.

(f) Radar view

Start Radar.

(g) Touch board

Start Touch board.

(h) Touch API Parameters

Start Touch API Parameters

(i) Touch API Registers

Start Touch API Registers.

(j) Start monitor

Start the monitoring to touch sensor on target board.

(k) Stop monitor

Stop the monitoring to touch sensor on target board.

(4) Tools

(a) Navigator

Start Navigator.

(a) First step guide

Start First step guide.

(b) Adjustment guide

Start Adjustment guide. Workbench does not support this function now.

(c) Tuning window

Start Tuning window.

(d) Source gallery

Start Source gallery. Workbench does not support this function now.

(e) Document manager

Start Document manager.

(f) Option

Starts Option. Workbench does not support this function now.

(g) Log play

Start the playing touch log file. If “Open” dialog is displayed, select a touch log file and press [OK] button.

(h) Log stop

Stop the playing or recoding touch log file.

(i) Log pause

Suspend the playing touch log file.

(j) Log record

Start the recording touch log file. If “Save As” dialog is displayed, select a touch log file and press [OK] button.

(5) Window

(6) Help

(a) About Workbench

Display Workbench version information.

2.1.2 Tool bar

This toolbar shows command buttons.

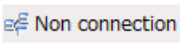
	Workbench starts connection with target board via serial port. If “Setup Serial port” dialog is displayed, select a serial port number and serial port baudrate and press [OK] button.
	Workbench ends connection with target board.
	Starts Touch API Parameters.
	Starts Touch API Registers.
	Starts Status monitor.
	Starts Slider monitor.
	Starts Wheel monitor.
	Starts Option.
	Starts First step guide.
	Starts Adjustment guide.
	Starts Tuning window.
	Starts monitoring touch sensor on target board.
	Stop the monitoring touch sensor on target board.
	Starts the playing touch log file.
	Stops the playing touch log file.
	Suspend the playing touch log file.
	Starts the recording touch log file.

2.1.3 Window display area

Touch sensor monitoring tools and Touch sensor tuning tools are displayed in this area.

2.1.4 Status bar

This displays status of connection between Workbench and target board and status of touch log file.

	Displays status of connection between Workbench and target board. - Non connection: Workbench does not connect with target board. - Connected(CS+): Workbench connects with target board via CS+. - Connected(e2 studio): Workbench connects with target board via e2 studio. - Connected(Serial port): Workbench connects with target board via serial port.
	Displays status of touch log file. - Log stop: Workbench does not play or record touch log file. - Log play: Workbench is playing touch log file. - Log pause: Workbench is suspending the playing touch log file. - Log record: Workbench is recording touch log file.

2.2 First step guide

First step guide generates the best program for the user's touch sensor microcontroller and guides automatic tuning of touch sensor sensitivity.

2.2.1 Start page

This is the start page of the First step guide. Press [Next] button.

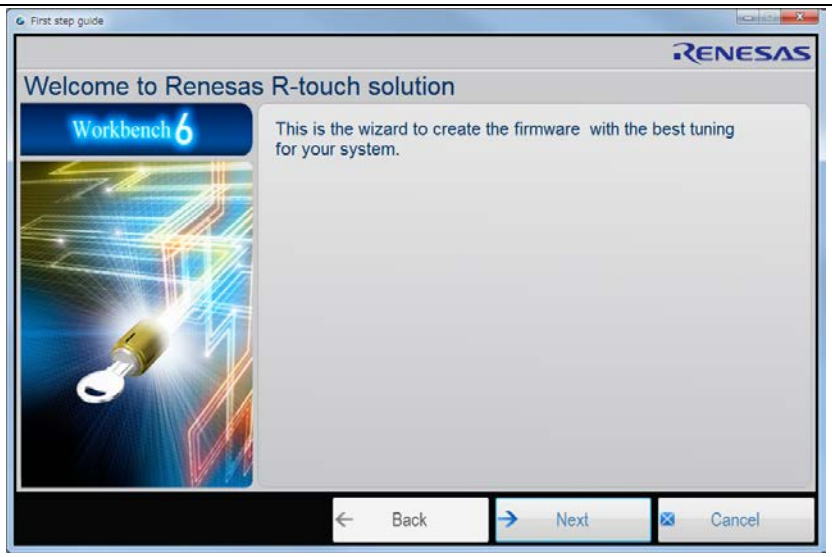


Figure 2-2 First step guide – Start page

Back	Cannot press this button.
Next	To the next page.
Cancel	Terminates the First step guide.

2.2.2 Integrated development environment selection

Select the Integrated development environment (hereinafter called IDE) and whether to use emulator or not.

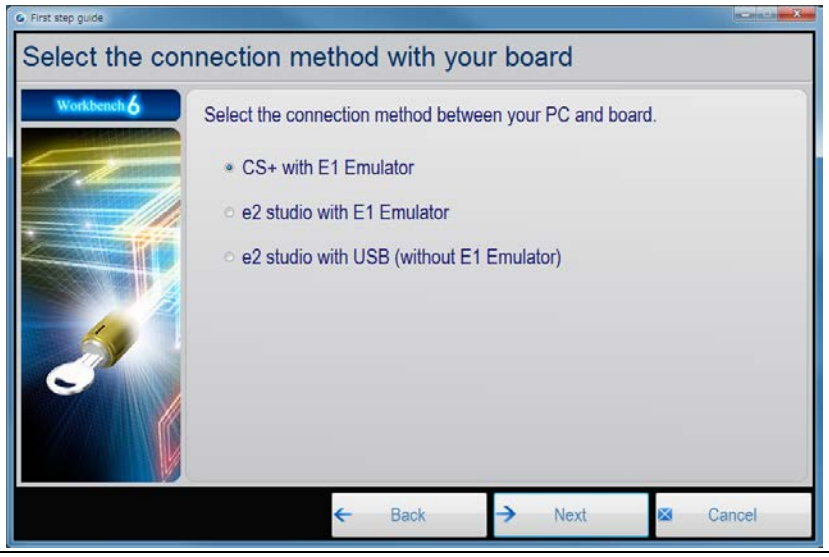

First step guide
Select the connection method with your board
Workbench 6
Select the connection method between your PC and board.
CS+ with E1 Emulator
e2 studio with E1 Emulator
e2 studio with USB (without E1 Emulator)
Back
Next
Cancel

Figure 2-3 First step guide – Integrated development environment selection

CS+ with E1 Emulator	Use CS+ with emulator.
e2 studio with E1 Emulator	Use e2 studio with emulator
e2 studio with USB (without E1 Emulator)	Use e2 studio without emulator.
Back	Back to the previous page.
Next	To the next page.
Cancel	Terminates the First step guide.

2.2.3 Touch MCU selection

This page is for selecting a touch sensor microcontroller to be used.

Figure 2-4 First step guide – Touch MCU selection

Series: RX110	A series of touch sensor microcontroller can be selected.
Group: RX113	A group of touch sensor microcontroller can be selected.
Part No.: R5F51138ADFP	A part number of touch sensor microcontroller can be selected.
12 pins	Displays the number of touch sensors of the touch sensor microcontroller selected at Series, Group, and Part No.
Back	Back to the previous page.
Next	To the next page.
Cancel	Terminates the First step guide.

2.2.4 Touch sensor CPU setting

This page is for selecting operating frequencies of the touch sensor microcontroller and touch sensors.

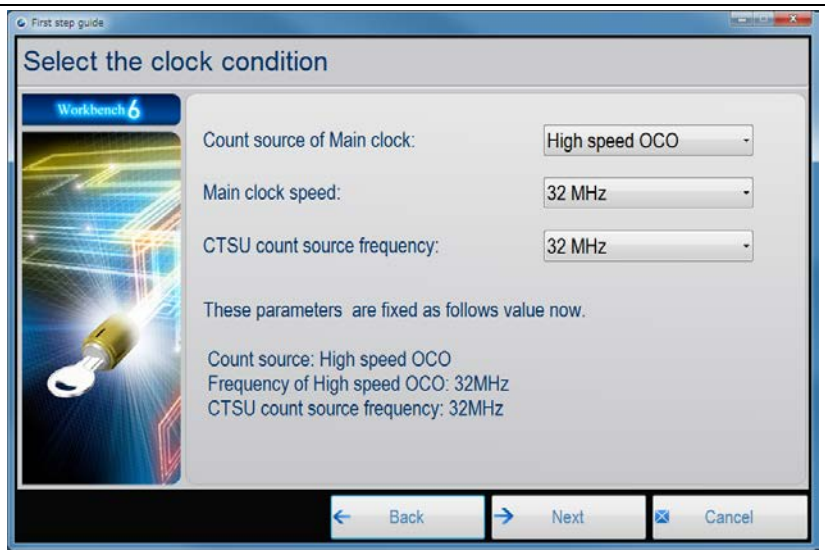


Figure 2-5 First step guide – Touch sensor CPU setting

Count source of Main clock: High speed OCO	A count source can be selected.
Main clock speed: 32 MHz	Frequency of the selected count source can be set.
CTSU count source frequency: 32 MHz	A count source of CTSU can be selected.
Back	Back to the previous page.
Next	To the next page.
Cancel	Terminates the First step guide.

2.2.5 Touch sensor measurement method selection

This page is for selecting touch detection method of the touch sensors.

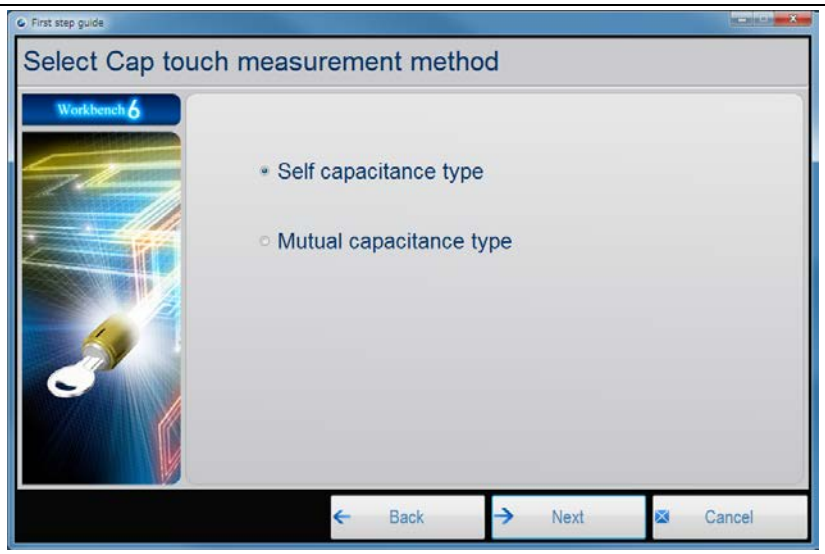


Figure 2-6 First step guide – Touch sensor measurement method selection

Self capacitance type	Self-capacitance is selected as touch detection method.
Mutual capacitance type	Mutual capacitance is selected as touch detection method.
Back	Back to the previous page.
Next	To the next page.
Cancel	Terminates the First step guide.

2.2.6 Touch interface definition

Layout touch interfaces according to touch interfaces on your target board.

(1) Touch interface definition – Self-capacitance

Touch interface definition that you selected self-capacitance as touch sensor detection method is as follows.

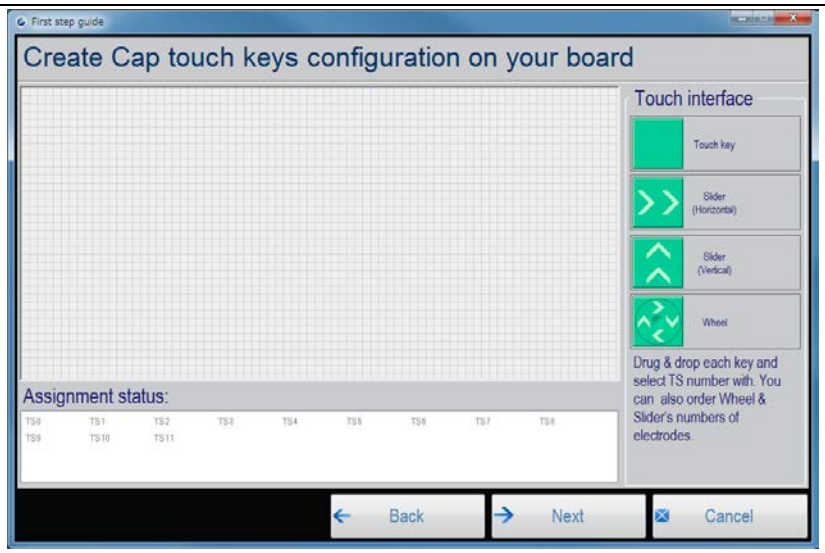


Figure 2-7 First step guide - Touch interface definition - Self-capacitance

	This is canvas that touch keys, sliders and wheels are laid out.
	Lays out a touch key on the canvas.
	Lays out a slider (horizontal) on the canvas.
	Lays out a slider (vertical) on the canvas.
	Lays out a wheel on the canvas.
Back	Back to the previous page.
Next	To the next page.
Cancel	Terminates the First step guide.

(2) Touch interface definition – Mutual capacitance

Touch interface definition that you selected Mutual capacitance as touch sensor detection method is as follows.

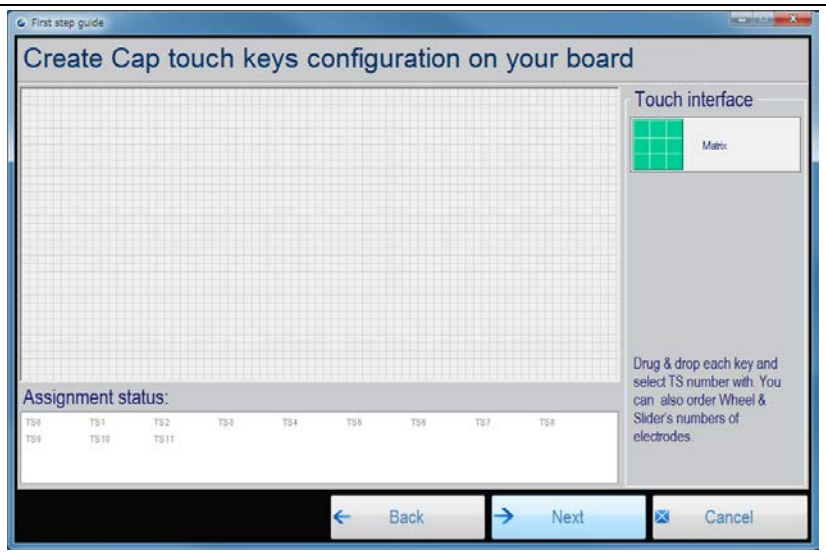

First step guide
Create Cap touch keys configuration on your board
Touch interface
Matrix
Drug & drop each key and select TS number with. You can also order Wheel & Slider's numbers of electrodes.
Assignment status:
Back
Next
Cancel

Figure 2-8 First step guide – Touch interface definition – Mutual capacitance

	This is canvas that touch keys, sliders and wheels are laid out.
	Lays out a matrix key on the canvas.
Back	Back to the previous page.
Next	To the next page.
Cancel	Terminates the First step guide.

2.2.7 Project store directory selection

This page is for selecting a directory to store a set of software for the touch sensor microcontroller corresponding to the selected IDE.

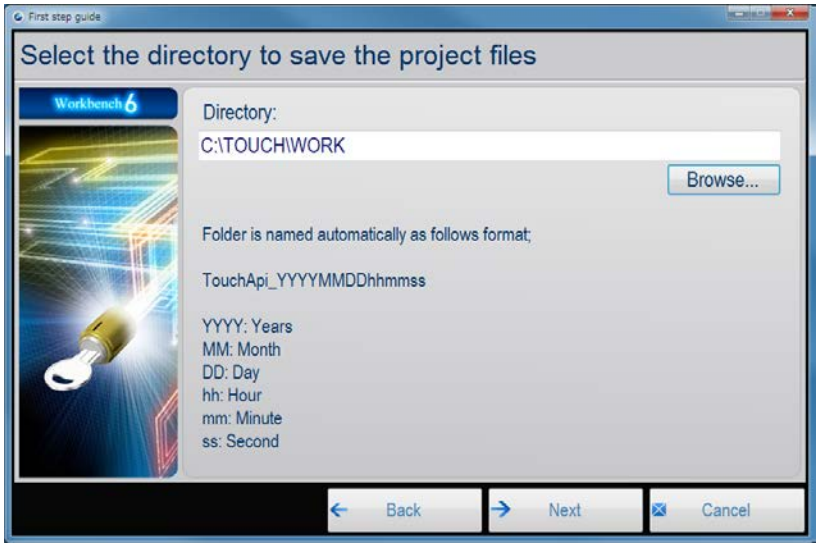
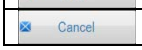


Figure 2-9 First step guide – Project store directory selection

	Displays an absolute path of the folder.
	Starts “Folder browser dialogue.
	Back to the previous page.
	To the next page.
	Terminates the First step guide.

2.2.8 Dumping resistance selection

This page is for setting dumping resistance values of the touch sensor microcontroller.

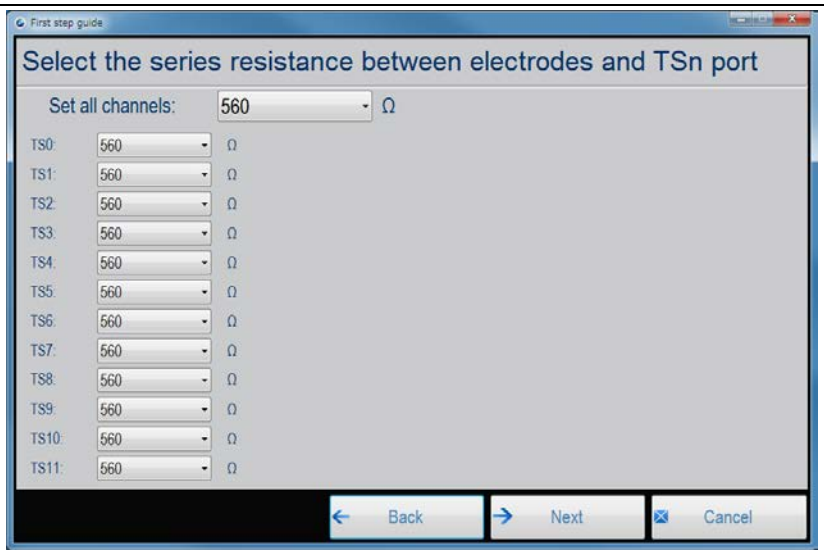


Figure 2-10 First step guide – Dumping resistance selection

Set all channels: 560	A dumping resistance value for all TS can be set collectively.
TS0: 560	A dumping resistance value for each TS can be set respectively.
Back	Back to the previous page.
Next	To the next page.
Cancel	Terminates the First step guide.

2.2.9 Target board preparation

This page is provided for guiding setup of the board with the touch sensor microcontroller.

(1) **Connection between PC and emulator**

Check connection between your PC and emulator. This guide is not displayed when Workbench recognized connection between PC and emulator.

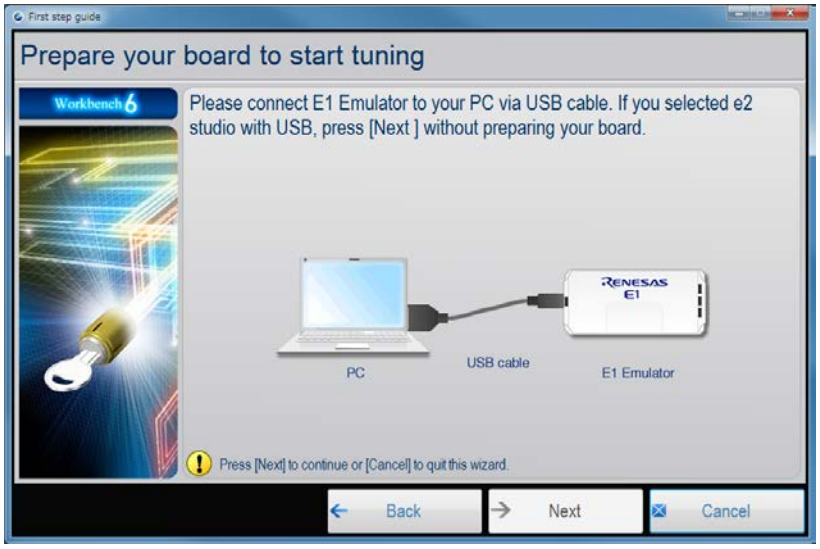

First step guide
Prepare your board to start tuning
Workbench 6
Please connect E1 Emulator to your PC via USB cable. If you selected e2 studio with USB, press [Next] without preparing your board.
RENESAS E1
PC
USB cable
E1 Emulator
Press [Next] to continue or [Cancel] to quit this wizard.
Back
Next
Cancel

Figure 2-11 First step guide – Connection between PC and emulator

Back	Back to the previous page.
Next	To the next page.
Cancel	Terminates the First step guide.

(1) Connection between emulator and target board

Check connection between emulator and your target board.

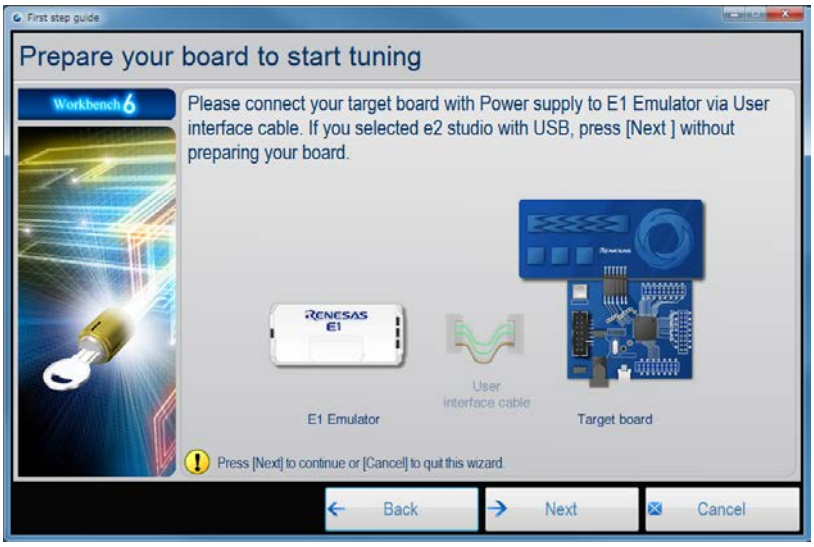

First step guide
Prepare your board to start tuning
Workbench 6
Please connect your target board with Power supply to E1 Emulator via User interface cable. If you selected e2 studio with USB, press [Next] without preparing your board.
RENESAS E1
E1 Emulator
User interface cable
Target board
Press [Next] to continue or [Cancel] to quit this wizard.
Back
Next
Cancel

Figure 2-12 First step guide – Connection between emulator and target board

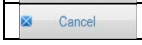
Back	Back to the previous page.
Next	To the next page.
Cancel	Terminates the First step guide.

2.2.10 Target board startup

This page is provided for guiding startup of the board with the touch sensor microcontroller.

(1) **IDE with emulator**

Figure 2-13 First step guide – Target board startup

	Shows a process on the right side of this icon was completed.
	Shows a process on the right side of this icon was not completed.
	Back to the previous page.
	To the next page.
	Terminates the First step guide.

(2) **IDE without emulator**

This page displays the following when you selected “e2 studio with USB (without Emulator)” in “Integrated Development Environment selection”.

First step guide
Target board startup
Workbench 6
If you do not have any emulator, follows the order below.
1. Create the object file from existed by Workbench using e2studio with CC-RX.
You should change [Build configuration] as much as Cap touch measurement method you selected.
- Self capacitance - DefaultBuild
- Mutual capacitance - Mutual
2. Connect USB cable between your board and PC.
3. Download it using RFP (Renesas Flash Programmer)
3. Remove USB cable and run your board
4. Re-connect USB
5. PC will require USB driver. Install COM driver in the DVD.
6. All the processes done, press Next button on this window
Press [Next] to continue or [Cancel] to quit this wizard.
Back
Next
Cancel

Figure 2-14 First step guide - IDE without emulator

Back	Back to the previous page.
Next	To the next page.
Cancel	Terminates the First step guide.

User must generate a program and starts your target board. The procedures are as follows.

1. **Start e2 studio.**
2. **Import a project output in directory which you choose in “Project store directory selection” to workspace of e2 studio.**
3. **Build the project.**
4. **Download program that is made by the build to your target board.**

2.2.11 Touch sensor automatic tuning phase 1 - Start

Starts touch sensor automatic tuning phase 1. Press [Next] button.

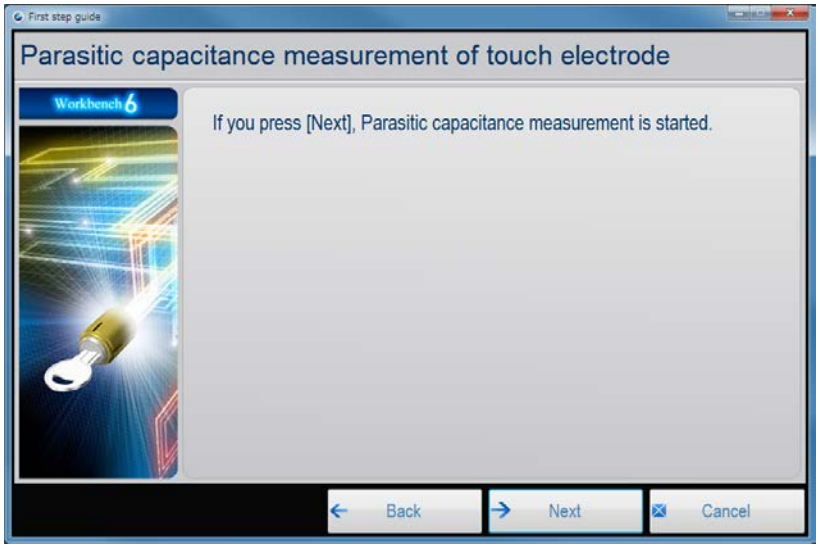


Figure 2-15 First step guide – Touch sensor automatic tuning phase 1

Back	Back to the previous page.
Next	To the next page.
Cancel	Terminates the First step guide.

2.2.12 Touch sensor automatic tuning phase 1 - Result

Show result of touch sensor automatic tuning phase 1.

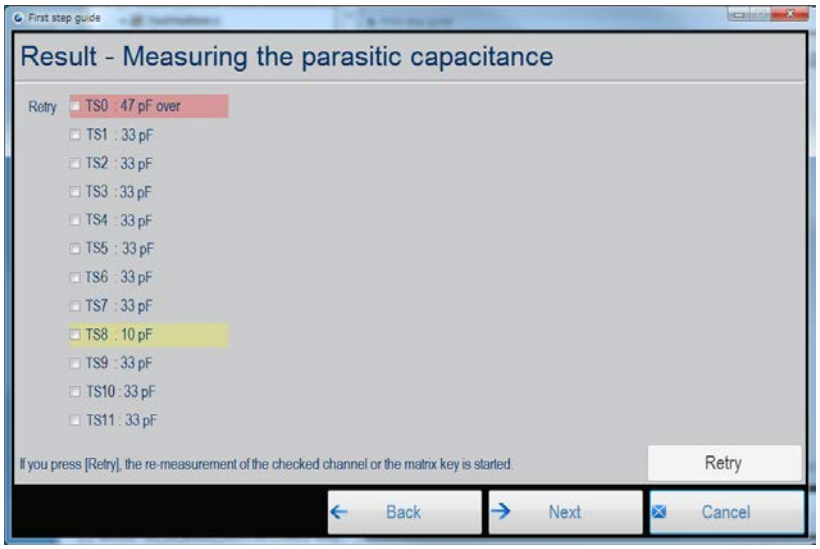

First step guide
Result - Measuring the parasitic capacitance
Retry
TS0 : 47 pF over
TS1 : 33 pF
TS2 : 33 pF
TS3 : 33 pF
TS4 : 33 pF
TS5 : 33 pF
TS6 : 33 pF
TS7 : 33 pF
TS8 : 10 pF
TS9 : 33 pF
TS10 : 33 pF
TS11 : 33 pF
If you press [Retry], the re-measurement of the checked channel or the matrix key is started.
Retry
Back
Next
Cancel

Figure 2-16 First step guide – Touch sensor automatic tuning phase1 - Result

TS7 : 33 pF	Parasitic capacitance of TS is normal.
TS8 : 10 pF	This is Warning to the Parasitic capacitance of TS.
TS0 : 47 pF over	This is Error to the Parasitic capacitance of TS.
Back	Back to the previous page.
Next	To the next page.
Cancel	Terminates the First step guide.

2.2.13 Touch sensor automatic tuning phase 2 - Start

Starts touch sensor automatic tuning phase 2.Press [Next] button.

Figure 2-17 First step guide – Touch sensor automatic tuning phase 2 - Start

Back	Back to the previous page.
Next	To the next page.
Cancel	Terminates the First step guide.

2.2.14 Touch sensor automatic tuning phase 2 - Tuning

Starts touch sensor automatic tuning phase 2.Press [Next] button.

Touch sensor automatic tuning phase 2 is in progress. When touch sensor automatic tuning phase 2 is finished, this page change to “Touch sensor automatic tuning phase 2 – Result” automatically.

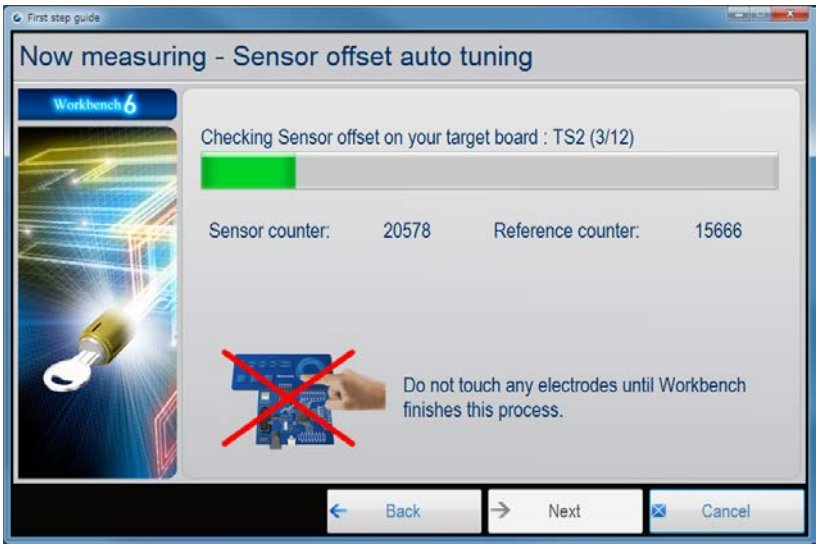

First step guide
Now measuring - Sensor offset auto tuning
Workbench 6
Checking Sensor offset on your target board : TS2 (3/12)
Sensor counter: 20578
Reference counter: 15666
Do not touch any electrodes until Workbench finishes this process.
Back
Next
Cancel

Figure 2-18 First step guide – Touch sensor automatic tuning phase 2 - Tuning

Back	Back to the previous page.
Next	Cannot press this button.
Cancel	Terminates the First step guide.

2.2.15 Touch sensor automatic tuning phase 2 - Result

Display result of touch sensor automatic tuning phase 2

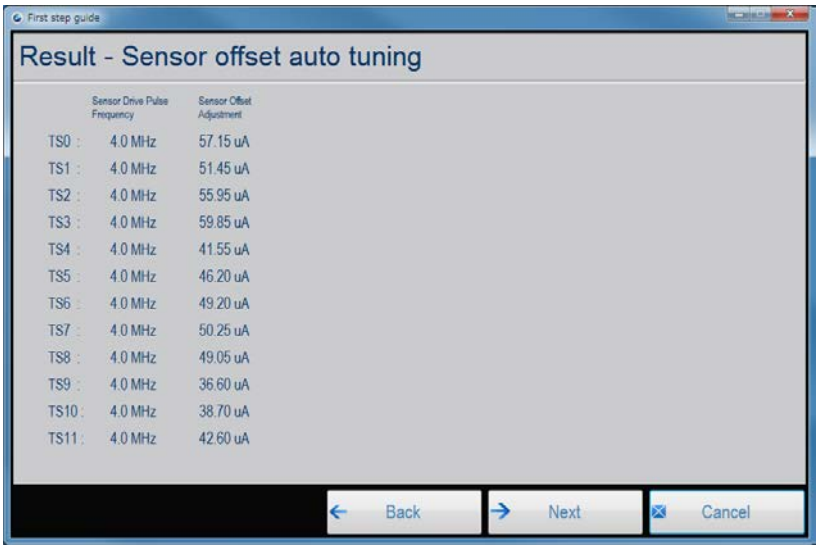

First step guide
Result - Sensor offset auto tuning
Sensor Drive Pulse Frequency
Sensor Offset Adjustment
TS0 : 4.0 MHz 57.15 uA
TS1 : 4.0 MHz 51.45 uA
TS2 : 4.0 MHz 55.95 uA
TS3 : 4.0 MHz 59.85 uA
TS4 : 4.0 MHz 41.55 uA
TS5 : 4.0 MHz 46.20 uA
TS6 : 4.0 MHz 49.20 uA
TS7 : 4.0 MHz 50.25 uA
TS8 : 4.0 MHz 49.05 uA
TS9 : 4.0 MHz 36.60 uA
TS10 : 4.0 MHz 38.70 uA
TS11 : 4.0 MHz 42.60 uA
Back
Next
Cancel

Figure 2-19 First step guide – Touch sensor automatic tuning phase 2 - Result

Sensor Drive Pulse Frequency 4.0 MHz	Show sensor drive pulse frequency.
Sensor Offset Adjustment 57.15 uA	Show sensor offset value.
Back	Back to the previous page.
Next	To the next page.
Cancel	Terminates the First step guide.

2.2.16 Touch sensor automatic tuning phase 3

(1) Self-capacitance

Starts touch sensor automatic tuning phase 3. Press [Next] button.

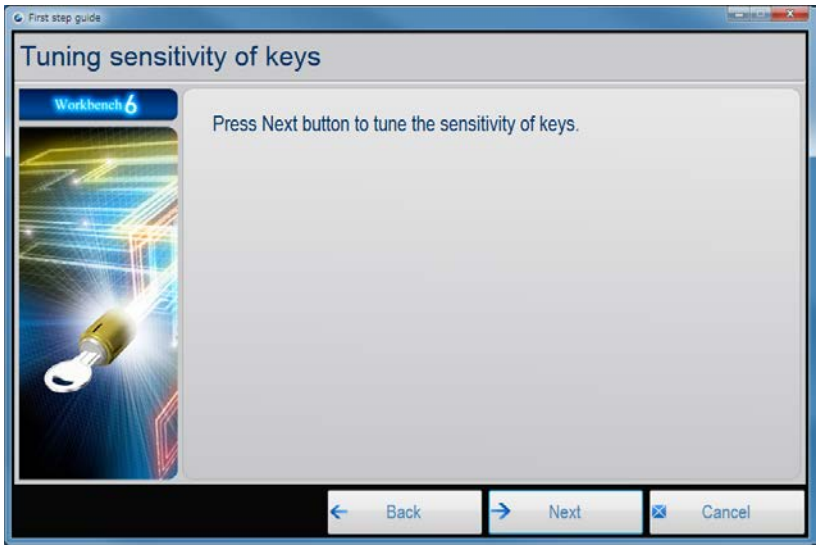


Figure 2-20 First step guide – Touch sensor automatic tuning phase 3 - Start

Back	Back to the previous page.
Next	To the next page.
Cancel	Terminates the First step guide.

(a) Touch sensor automatic tuning phase 3 – Touch key tuning

Touch key with TS number is surrounded by red frame is an object of sensitivity tuning. At first, push “Y” key on keyboard of your PC while touching the touch key with a finger well or with an iron stick. Afterwards repeat three times that “Y” key on keyboard of your PC while touching the touch key with a finger commonly.

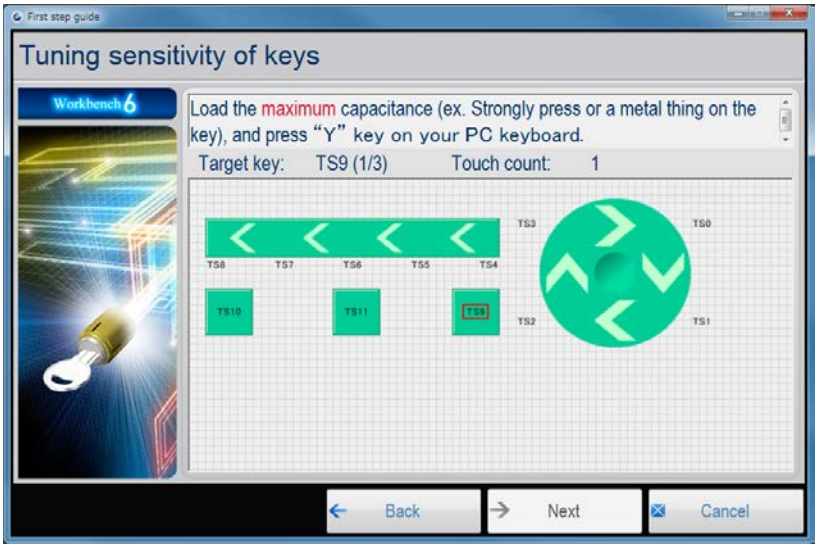


Figure 2-21 First step guide – Touch sensor automatic tuning phase 3- Touch key tuning

TS9	Shows touch key for tuning.
Back	Back to the previous page.
Next	To the next page.
Cancel	Terminates the First step guide.

(a) Touch sensor automatic tuning – Slider and Wheel checking

Before sensitive tuning of slider and wheel, Workbench checks the status of all sliders and wheels. This check starts by press “Y” key on keyboard of your PC. In addition, you must not touch sliders and wheels during this check.

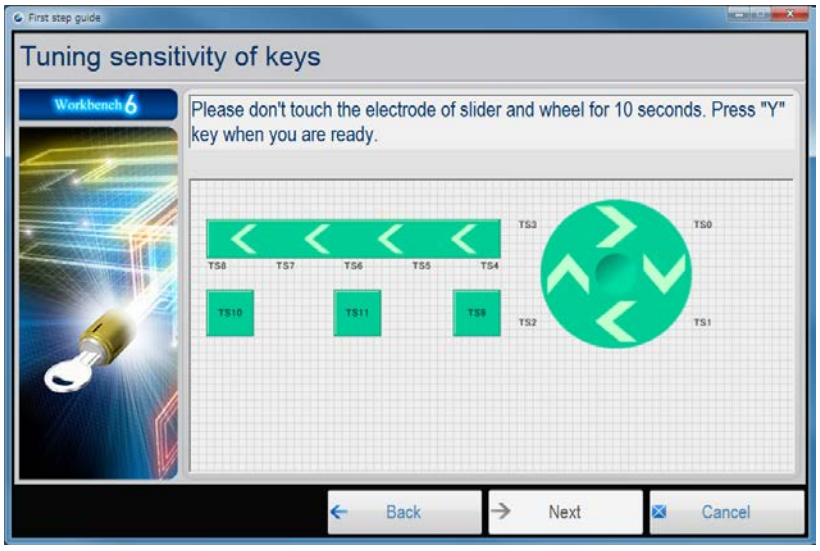


Figure 2-22 First step guide – Touch sensor automatic tuning – Slider and Wheel checking

Back	Back to the previous page.
Next	To the next page.
Cancel	Terminates the First step guide.

(b) Touch sensor automatic tuning phase 3 – Slider tuning

After the check of sliders and wheels, Workbench starts sensitivity tuning of the sliders by pushing “Y” key on keyboard of your PC.

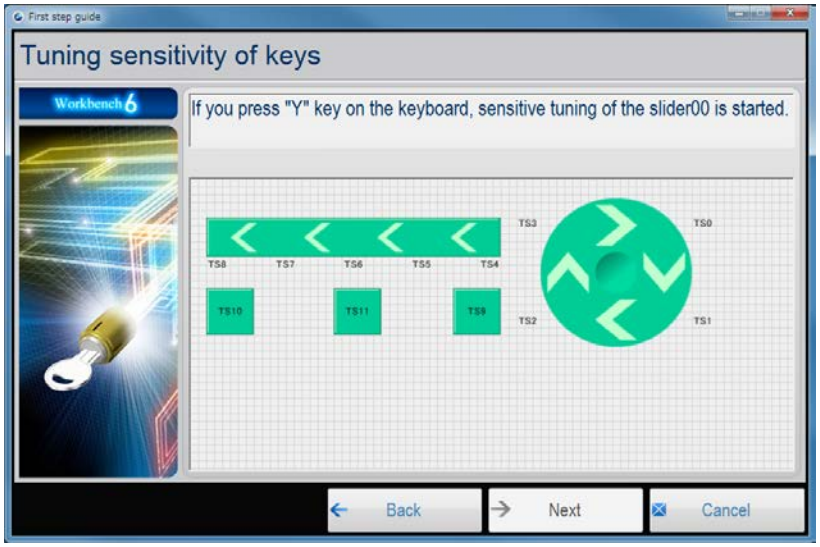


Figure 2-23 First step guide – Touch sensor automatic tuning phase 3 – Slider tuning start

Back	Back to the previous page.
Next	To the next page.
Cancel	Terminates the First step guide.

A slider composed of TS surrounded with red frame is an object of slider sensitivity tuning. After sliding the slider on your target board three or four times, press “Y” key on keyboard of your PC.

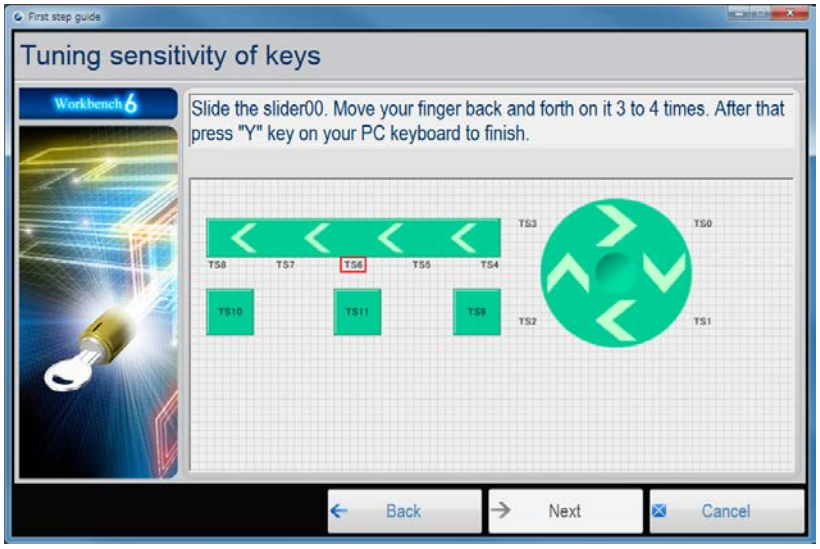
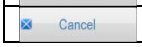


Figure 2-24 First step guide – Touch sensor automatic tuning phase 3 –slider tuning

	Shows a slider for tuning.
	Back to the previous page.
	To the next page.
	Terminates the First step guide.

(c) Touch sensor automatic tuning phase 3 – Wheel tuning

After the check of sliders and wheels or sensitivity tuning of slider, Workbench starts sensitivity tuning of the wheels by pushing “Y” key on keyboard of your PC.

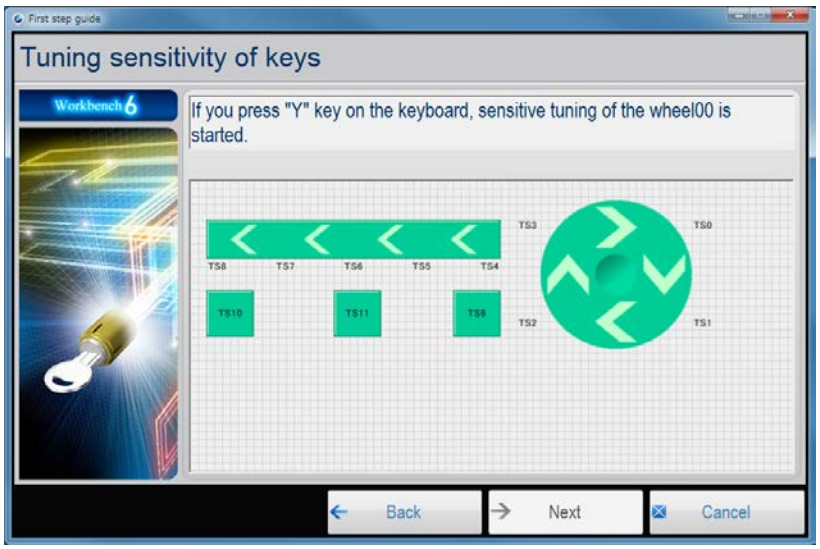


Figure 2-25 First step guide – Touch sensor automatic tuning phase 3 – Wheel tuning start

Back	Back to the previous page.
Next	To the next page.
Cancel	Terminates the First step guide.

A wheel composed of TS surrounded with red frame is an object of wheel sensitivity tuning. After spin the wheel on your target board three or four times, press “Y” key on keyboard of your PC.

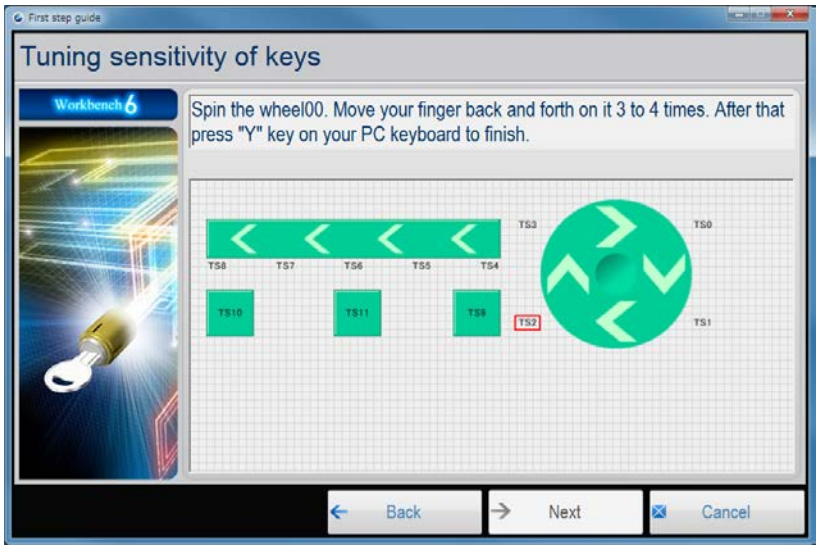
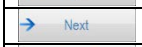
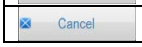


Figure 2-26 First step guide – Touch sensor automatic tuning phase 3 – Wheel tuning

	Shows a wheel for tuning.
	Back to the previous page.
	To the next page.
	Terminates the First step guide.

(2) Mutual capacitance

Starts touch sensor automatic tuning phase 3. Press [Next] button.

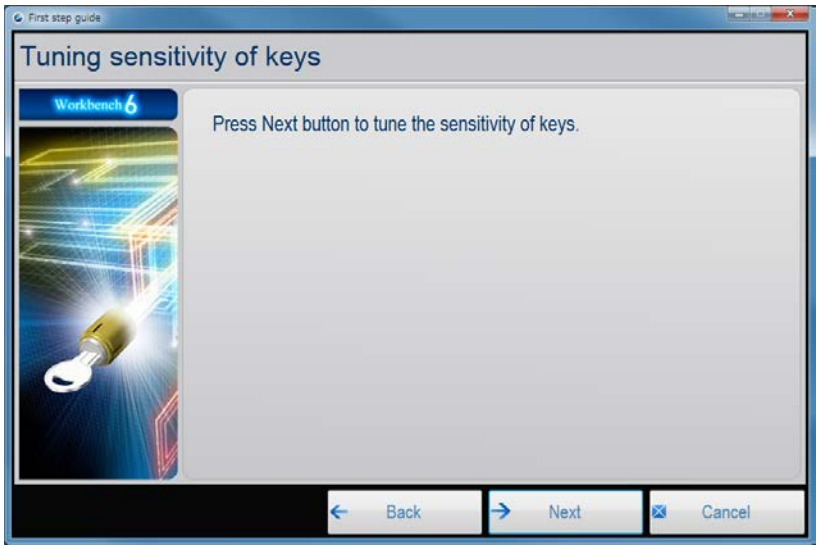


Figure 2-27 First step guide – Touch sensor automatic tuning phase 3 – Mutual capacitance - Start

Back	Back to the previous page.
Next	To the next page.
Cancel	Terminates the First step guide.

(a) Touch sensor automatic tuning phase 3 – Matrix key sensitivity tuning

Matrix key with TS number surrounded by red frame is an object of sensitivity tuning. At first, push “Y” key on keyboard of your PC while touching the matrix key with a finger well or with an iron stick. Afterwards repeat three times that “Y” key on keyboard of your PC while touching the matrix key with a finger commonly.

Figure 2-28 First step guide – Touch sensor automatic tuning phase 3 – Matrix key tuning

	Shows matrix key for tuning.
Back	Back to the previous page.
Next	To the next page.
Cancel	Terminates the First step guide.

2.2.17 Touch sensor automatic tuning phase 3 - Result

Shows result of touch sensor automatic tuning phase 3. Press [Next] button to output the result of touch sensor automatic tuning to source files.

(1) Self-capacitance

Display the result of touch sensor automatic tuning phase 3 with following six kinds when touch sensor detection method is self-capacitance.

(a) Capacitance value

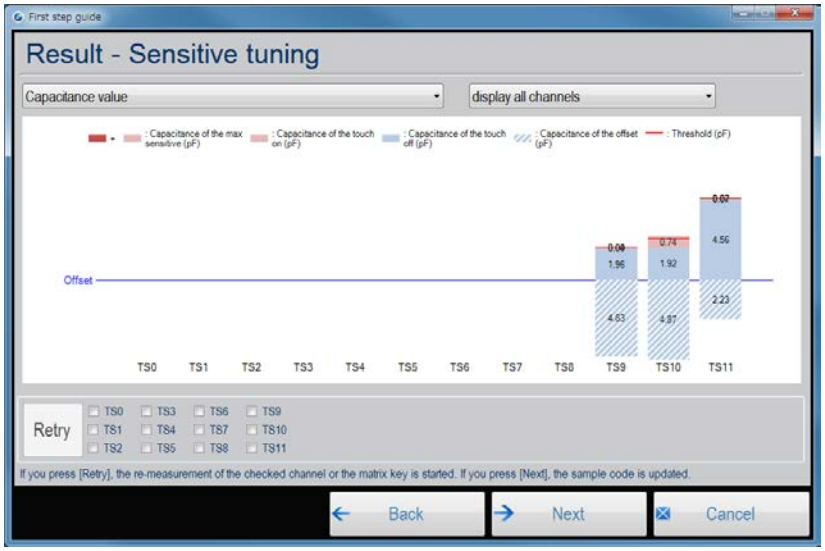


Figure 2-29 First step guide – Touch sensor automatic tuning phase 3 - Capacitance value

Capacitance value	Change the result of touch sensor automatic tuning phase 3.
display all channels	Select the number of TS to display to a window with 12 channels or with all channels.
+	Show Capacitance of the maximum sensitive.
	Show Capacitance of Touch.
	Show Capacitance of Non-touch.
	Shows Capacitance of the offset.
	Show Threshold count value.
TS0	Select TS to retry touch sensor automatic tuning phase 3.
Retry	Press [Retry] to execute touch sensor automatic tuning phase 3 if TS to retry is set.
Back	Back to the previous page.
Next	To the next page.
Cancel	Terminates the First step guide.

(a) Sensor Counter value (without Measurement count)

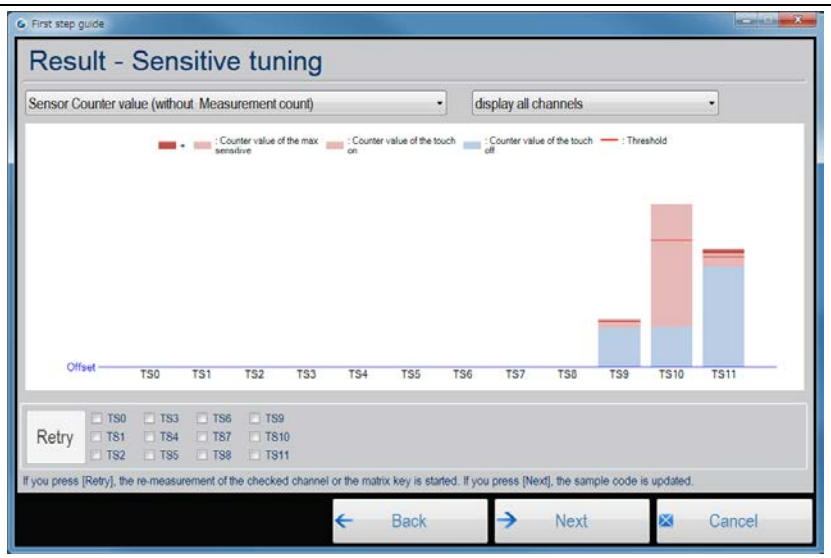

First step guide
Result - Sensitive tuning
Sensor Counter value (without Measurement count)
display all channels
: Counter value of the max sensitive
: Counter value of the touch on
: Counter value of the touch off
: Threshold
Offset
TS0 TS1 TS2 TS3 TS4 TS5 TS6 TS7 TS8 TS9 TS10 TS11
Retry
TS0 TS3 TS6 TS9
TS1 TS4 TS7 TS10
TS2 TS5 TS8 TS11
If you press [Retry], the re-measurement of the checked channel or the matrix key is started. If you press [Next], the sample code is updated.
Back
Next
Cancel

Figure 2-30 First step guide - Touch sensor automatic tuning phase 3 - Sensor Counter value (without Measurement count)

Sensor Counter value (without Measurement count)	Change the result of touch sensor automatic tuning phase 3.
display all channels	Select the number of TS to display to a window with 12 channels or with all channels.
+	Show Capacitance of the maximum sensitive.
	Show Capacitance of Touch.
	Show Capacitance of Non-touch.
	Show Threshold count value.
TS0	Select TS to retry touch sensor automatic tuning phase 3.
Retry	Press [Retry] to execute touch sensor automatic tuning phase 3 if TS to retry is set.
Back	Back to the previous page.
Next	To the next page.
Cancel	Terminates the First step guide.

(b) Sensor Counter value (include Measurement count)

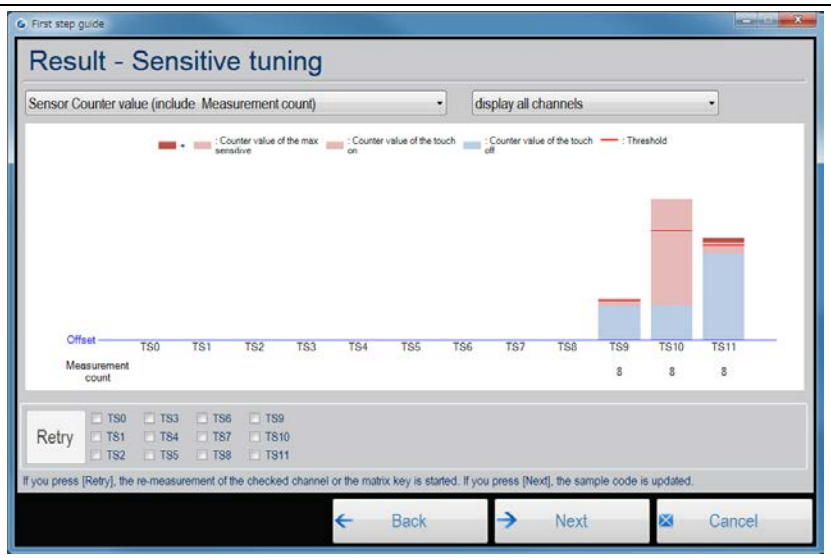

First step guide
Result - Sensitive tuning
Sensor Counter value (include Measurement count)
display all channels
: Counter value of the max sensitive
: Counter value of the touch on
: Counter value of the touch off
: Threshold
Offset
TS0 TS1 TS2 TS3 TS4 TS5 TS6 TS7 TS8 TS9 TS10 TS11
Measurement count
8 8 8
Retry
TS0 TS3 TS6 TS9
TS1 TS4 TS7 TS10
TS2 TS5 TS8 TS11
If you press [Retry], the re-measurement of the checked channel or the matrix key is started. If you press [Next], the sample code is updated.
Back
Next
Cancel

Figure 2-31 First step guide - Touch sensor automatic tuning phase 3 - Sensor Counter value (include Measurement count)

Sensor Counter value (include Measurement count)	Change the result of touch sensor automatic tuning phase 3.
display all channels	Select the number of TS to display to a window with 12 channels or with all channels.
+	Show Capacitance of the maximum sensitive.
	Show Capacitance of Touch.
	Show Capacitance of Non-touch.
	Show Threshold count value.
TS0	Select TS to retry touch sensor automatic tuning phase 3.
Retry	Press [Retry] to execute touch sensor automatic tuning phase 3 if TS to retry is set.
Back	Back to the previous page.
Next	To the next page.
Cancel	Terminates the First step guide.

(c) Sensor Counter value (include Measurement count / Expansion display)

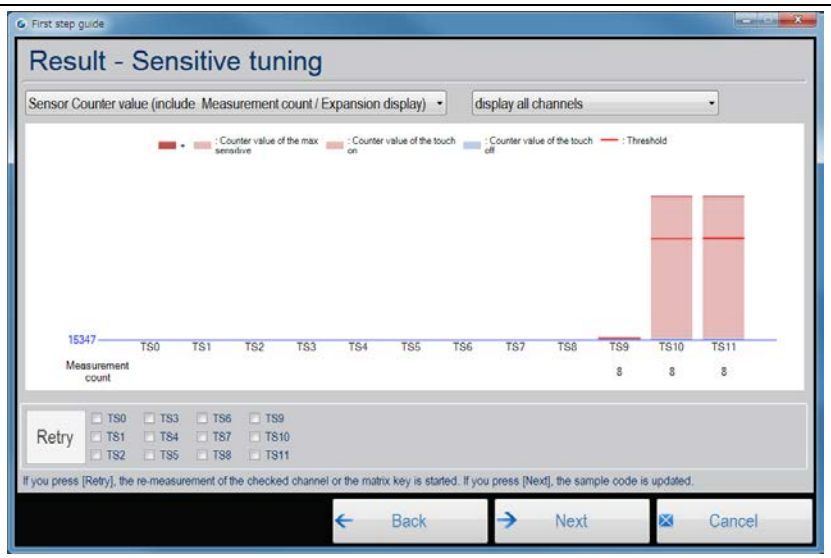

First step guide
Result - Sensitive tuning
Sensor Counter value (include Measurement count / Expansion display)
display all channels
: Counter value of the max sensitive
: Counter value of the touch on
: Counter value of the touch off
: Threshold
15347
TS0 TS1 TS2 TS3 TS4 TS5 TS6 TS7 TS8 TS9 TS10 TS11
Measurement count
8 8 8
Retry
TS0 TS3 TS6 TS9
TS1 TS4 TS7 TS10
TS2 TS5 TS8 TS11
If you press [Retry], the re-measurement of the checked channel or the matrix key is started. If you press [Next], the sample code is updated.
Back
Next
Cancel

Figure 2-32 First step guide - Touch sensor automatic tuning phase 3 - Sensor Counter value (include Measurement count / Expansion display)

Sensor Counter value (include Measurement count / Expansion display)	Change the result of touch sensor automatic tuning phase 3.
display all channels	Select the number of TS to display to a window with 12 channels or with all channels.
+	Show Capacitance of the maximum sensitive.
	Show Capacitance of Touch.
	Show Capacitance of Non-touch.
	Show Threshold count value.
TS0	Select TS to retry touch sensor automatic tuning phase 3.
Retry	Press [Retry] to execute touch sensor automatic tuning phase 3 if TS to retry is set.
Back	Back to the previous page.
Next	To the next page.
Cancel	Terminates the First step guide.

(d) Measurement time

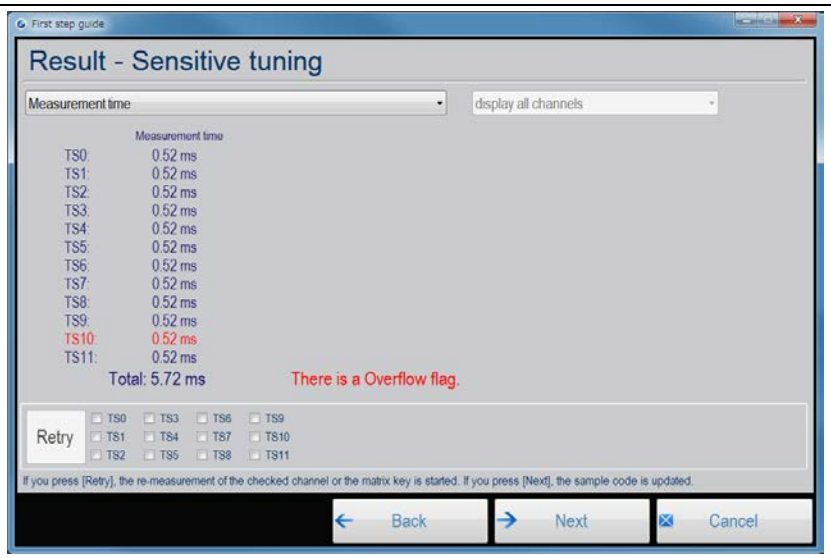


Figure 2-33 First step guide - Touch sensor automatic tuning phase 3 - Measurement time

Measurement time	Change the result of touch sensor automatic tuning phase 3.
display all channels	Select the number of TS to display to a window with 12 channels or with all channels.
Measurement time 0.52 ms	Show Measurement time.
Total: 5.72 ms	Show total time of Measurement time.
TS0	Select TS to retry touch sensor automatic tuning phase 3.
Retry	Press [Retry] to execute touch sensor automatic tuning phase 3 if TS to retry is set.
Back	Back to the previous page.
Next	To the next page.
Cancel	Terminates the First step guide.

(e) Slider / Wheel threshold

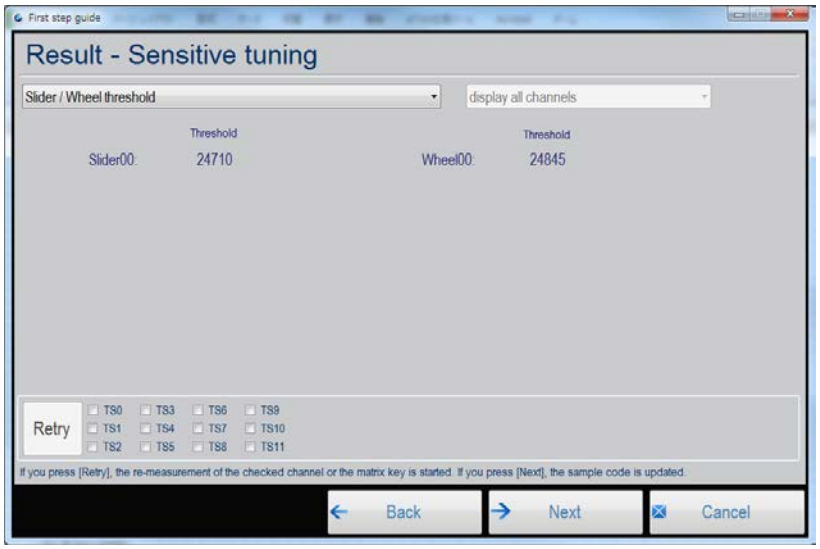


Figure 2-34 First step guide - Touch sensor automatic tuning phase 3 – Slider / Wheel threshold

Slider / Wheel threshold	Change the result of touch sensor automatic tuning phase 3.
display all channels	Select the number of TS to display to a window with 12 channels or with all channels.
Threshold 24710	Show Threshold of Slider or Wheel.
TS0	Select TS to retry touch sensor automatic tuning phase 3.
Retry	Press [Retry] to execute touch sensor automatic tuning phase 3 if TS to retry is set.
Back	Back to the previous page.
Next	To the next page.
Cancel	Terminates the First step guide.

(2) Mutual capacitance

Display the result of touch sensor automatic tuning phase 3 with following five kinds when touch sensor detection method is mutual capacitance.

(a) Capacitance ratio

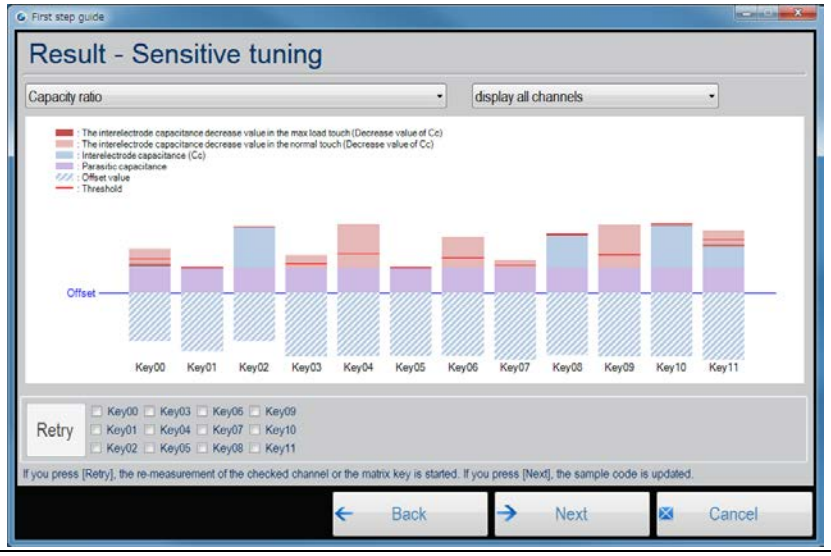

First step guide
Result - Sensitive tuning
Capacity ratio
display all channels
: The interelectrode capacitance decrease value in the max load touch (Decrease value of Cc)
: The interelectrode capacitance decrease value in the normal touch (Decrease value of Cc)
: Interelectrode capacitance (Cc)
: Parasitic capacitance
: Offset value
: Threshold
Offset
Key00 Key01 Key02 Key03 Key04 Key05 Key06 Key07 Key08 Key09 Key10 Key11
Retry
Key00 Key03 Key06 Key09
Key01 Key04 Key07 Key10
Key02 Key05 Key08 Key11
If you press [Retry], the re-measurement of the checked channel or the matrix key is started. If you press [Next], the sample code is updated.
Back
Next
Cancel

Figure 2-35 First step guide - Touch sensor automatic tuning phase 3 - Capacitance value

Capacity ratio	Change the result of touch sensor automatic tuning phase 3.
display all channels	Select the number of TS to display to a window with 12 channels or with all channels.
	Show the inter electrode capacitance decrease value in the max load touch.
	Show the inter-electrode capacitance decrease value in the normal touch.
	Show Inter-electrode capacitance.
	Show Parasitic capacitance.
	Show Offset value
	Show Threshold count value.
TS0	Select TS to retry touch sensor automatic tuning phase 3.
Retry	Press [Retry] to execute touch sensor automatic tuning phase 3 if TS to retry is set.
Back	Back to the previous page.
Next	To the next page.
Cancel	Terminates the First step guide.

(a) Sensor Counter value (without Measurement count)

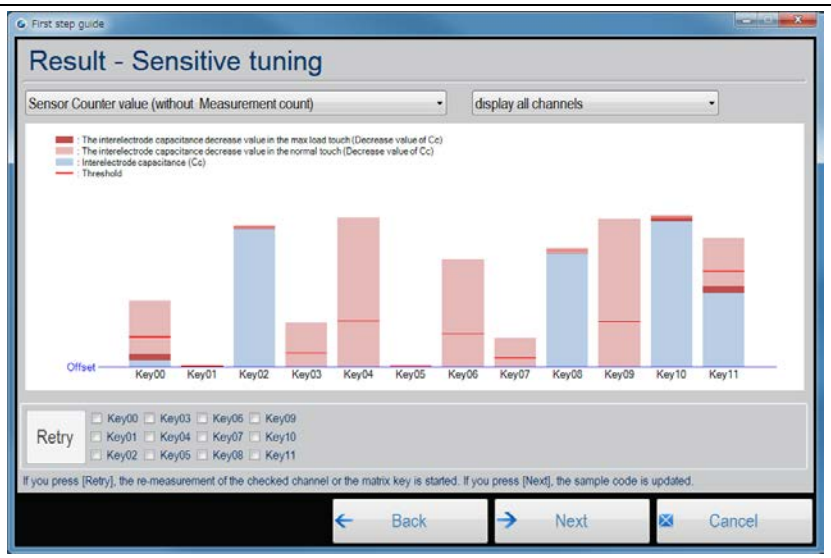

First step guide
Result - Sensitive tuning
Sensor Counter value (without Measurement count)
display all channels
: The interelectrode capacitance decrease value in the max load touch (Decrease value of Cc)
: The interelectrode capacitance decrease value in the normal touch (Decrease value of Cc)
: Interelectrode capacitance (Cc)
: Threshold
Offset
Key00 Key01 Key02 Key03 Key04 Key05 Key06 Key07 Key08 Key09 Key10 Key11
Retry
Key00 Key03 Key06 Key09
Key01 Key04 Key07 Key10
Key02 Key05 Key08 Key11
If you press [Retry], the re-measurement of the checked channel or the matrix key is started. If you press [Next], the sample code is updated.
Back
Next
Cancel

Figure 2-36 First step guide - Touch sensor automatic tuning phase 3 - Sensor Counter value (without Measurement count)

Sensor Counter value (without Measurement count)	Change the result of touch sensor automatic tuning phase 3.
display all channels	Select the number of TS to display to a window with 12 channels or with all channels.
	Show the inter electrode capacitance decrease value in the max load touch.
	Show the inter-electrode capacitance decrease value in the normal touch.
	Show Inter-electrode capacitance.
	Show Threshold count value.
TS0	Select TS to retry touch sensor automatic tuning phase 3.
Retry	Press [Retry] to execute touch sensor automatic tuning phase 3 if TS to retry is set.
Back	Back to the previous page.
Next	To the next page.
Cancel	Terminates the First step guide.

(b) Sensor Counter value (include Measurement count)

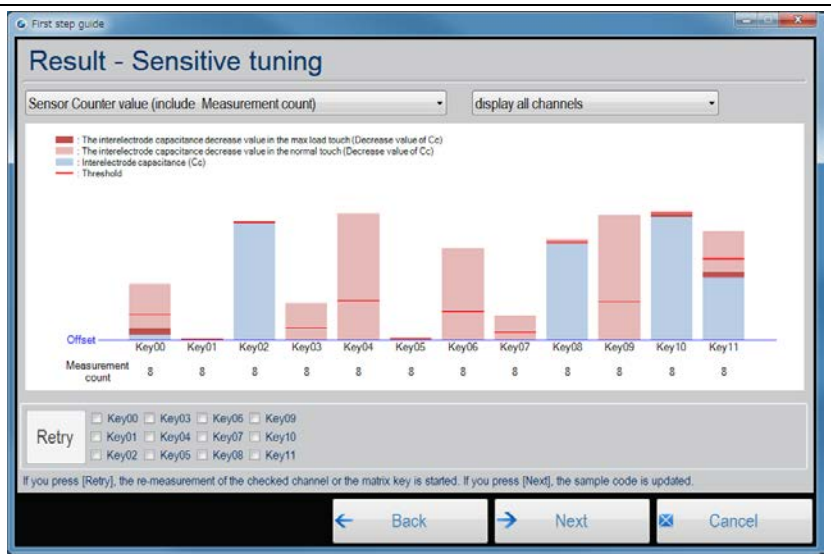

First step guide
Result - Sensitive tuning
Sensor Counter value (include Measurement count)
display all channels
: The interelectrode capacitance decrease value in the max load touch (Decrease value of Cc)
: The interelectrode capacitance decrease value in the normal touch (Decrease value of Cc)
: Interelectrode capacitance (Cc)
: Threshold
Offset
Key00 Key01 Key02 Key03 Key04 Key05 Key06 Key07 Key08 Key09 Key10 Key11
Measurement count
8 8 8 8 8 8 8 8 8 8 8 8
Retry
Key00 Key03 Key06 Key09
Key01 Key04 Key07 Key10
Key02 Key05 Key08 Key11
If you press [Retry], the re-measurement of the checked channel or the matrix key is started. If you press [Next], the sample code is updated.
Back
Next
Cancel

Figure 2-37 First step guide - Touch sensor automatic tuning phase 3 - Sensor Counter value (include Measurement count)

Sensor Counter value (include Measurement count)	Change the result of touch sensor automatic tuning phase 3.
display all channels	Select the number of TS to display to a window with 12 channels or with all channels.
	Show the inter electrode capacitance decrease value in the max load touch.
	Show the inter-electrode capacitance decrease value in the normal touch.
	Show Inter-electrode capacitance.
	Show Threshold count value.
TS0	Select TS to retry touch sensor automatic tuning phase 3.
Retry	Press [Retry] to execute touch sensor automatic tuning phase 3 if TS to retry is set.
Back	Back to the previous page.
Next	To the next page.
Cancel	Terminates the First step guide.

(c) Sensor Counter value (include Measurement count / Expansion display)

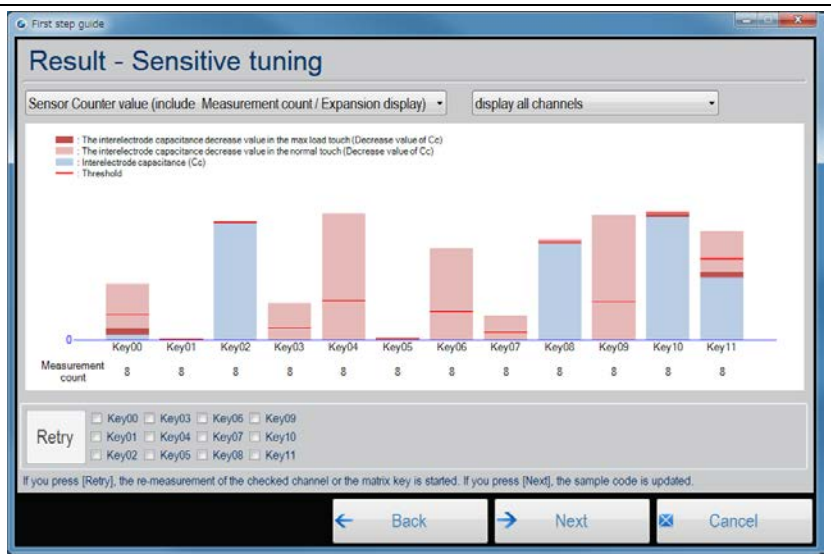

First step guide
Result - Sensitive tuning
Sensor Counter value (include Measurement count / Expansion display)
display all channels
: The interelectrode capacitance decrease value in the max load touch (Decrease value of Cc)
: The interelectrode capacitance decrease value in the normal touch (Decrease value of Cc)
: Interelectrode capacitance (Cc)
: Threshold
Key00 Key01 Key02 Key03 Key04 Key05 Key06 Key07 Key08 Key09 Key10 Key11
Measurement count
Retry
If you press [Retry], the re-measurement of the checked channel or the matrix key is started. If you press [Next], the sample code is updated.
Back
Next
Cancel

Figure 2-38 First step guide - Touch sensor automatic tuning phase 3 - Sensor Counter value (include Measurement count / Expansion display)

Sensor Counter value (include Measurement count / Expansion display)	Change the result of touch sensor automatic tuning phase 3.
display all channels	Select the number of TS to display to a window with 12 channels or with all channels.
	Show the inter electrode capacitance decrease value in the max load touch.
	Show the inter-electrode capacitance decrease value in the normal touch.
	Show Inter-electrode capacitance.
	Show Threshold count value.
TS0	Select TS to retry touch sensor automatic tuning phase 3.
Retry	Press [Retry] to execute touch sensor automatic tuning phase 3 if TS to retry is set.
Back	Back to the previous page.
Next	To the next page.
Cancel	Terminates the First step guide.

(d) Measurement time

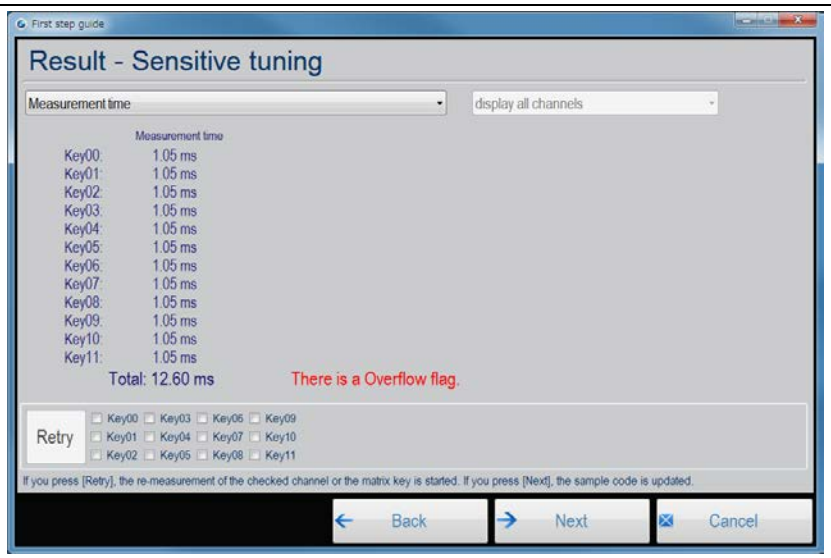


Figure 2-39 First step guide – Touch sensor automatic tuning phase 3 - Measurement time

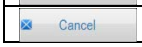
Measurement time	Change the result of touch sensor automatic tuning phase 3.
display all channels	Select the number of TS to display to a window with 12 channels or with all channels.
Measurement time 0.52 ms	Show Measurement time.
Total: 5.72 ms	Show total time of Measurement time.
TS0	Select TS to retry touch sensor automatic tuning phase 3.
Retry	Press [Retry] to execute touch sensor automatic tuning phase 3 if TS to retry is set.
Back	Back to the previous page.
Next	To the next page.
Cancel	Terminates the First step guide.

2.2.18 Target board reboot

This page builds source file that is updated by the result of touch sensor automatic tuning and reboot your target board.

(1) IDE with Emulator

Figure 2-40 First step guide – Target board reboot

	Shows a process on the right side of this icon was completed.
	Shows a process on the right side of this icon was not completed.
	Back to the previous page.
	To the next page.
	Terminates the First step guide.

(2) IDE without Emulator

This page displays the following when you selected “e2 studio with USB (without Emulator)” in “Integrated Development Environment selection”.

First step guide
Target board startup
Workbench 6
If you do not have any emulator, follows the order below.
1. Create the object file from existed by Workbench using e2studio with CC-RX.
You should change [Build configuration] as much as Cap touch measurement method you selected.
- Self capacitance - DefaultBuild
- Mutual capacitance - Mutual
2. Connect USB cable between your board and PC.
3. Download it using RFP (Renesas Flash Programmer)
3. Remove USB cable and run your board
4. Re-connect USB
5. PC will require USB driver. Install COM driver in the DVD.
6. All the processes done, press Next button on this window
Press [Next] to continue or [Cancel] to quit this wizard.
Back
Next
Cancel

Figure 2-41 First step guide – IDE without emulator

User must generate a program and starts your target board. The procedures are as follows.

5. **Start e2 studio.**
6. **Build the project.**
7. **Download program that is made by the build to your target board.**

2.3 Tuning window

2.3.1 Status monitor

Status monitor displays touch sensor sensitivity in real time.

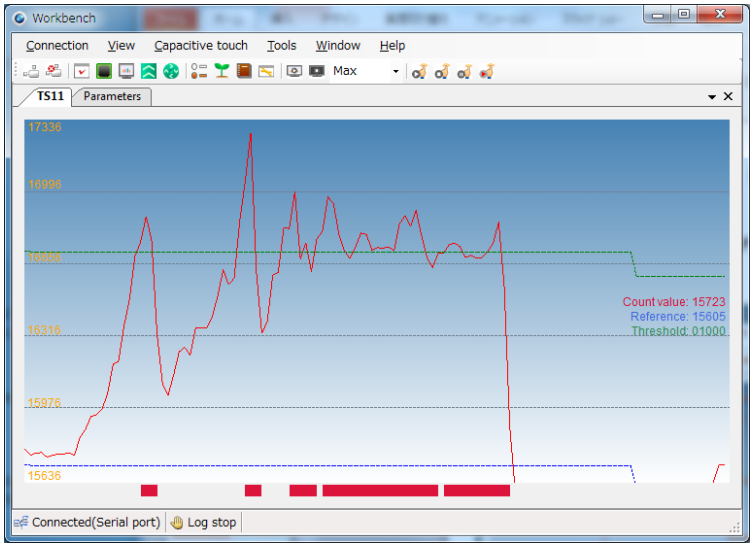
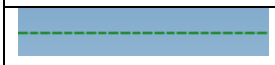
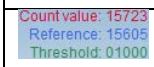


Figure 2-42 Status monitor

	Shows count value.
	Show reference value. When TS is a part of slider or wheel, Status monitor does not display reference value.
	Shows Threshold count value for judgment of touch or not. Hereinafter the “Threshold count value for judgment of touch no not” is called “Threshold count value”. When TS is a part of slider or wheel, Status monitor does not display threshold count value.
	Show result of Judgment process for touch or not. Hereinafter the “Judgment process for touch or not” is called “Judgment process”. When TS is a part of slider or wheel, Status monitor does not display judgment touch or not.
	Show numerical value of count value and reference count value, threshold count value.
	Show grid line.
	Show the value of count value on grid line.

(1) Context menu

(a) TS Select

Select a TS number to monitor in Status monitor.

(a) Display

- Numerical value

  Show and hide numerical value of count value and reference value, threshold count value.
- Scale

  Shows and hides the value of count value on grid line.
- Zoom in

  Enlarge view area.
- Zoom out

  Reduce view area.
- Up

  Push upward view area.
- Down

  Push downward view area.

(b) Close

Exit Status monitor.

(2) Shortcut key

(a) Ctrl + “+”

Enlarge view area.

(a) Ctrl + “-“

Reduce view area.

(b) Ctrl + “Up”, Ctrl + “PageUp”

Push upward view area.

(c) Ctrl + “Down”, Ctrl + “PageDown”

Push downward view area.

2.3.2 Slider monitor

Slider monitor displays slider touch position in real time.

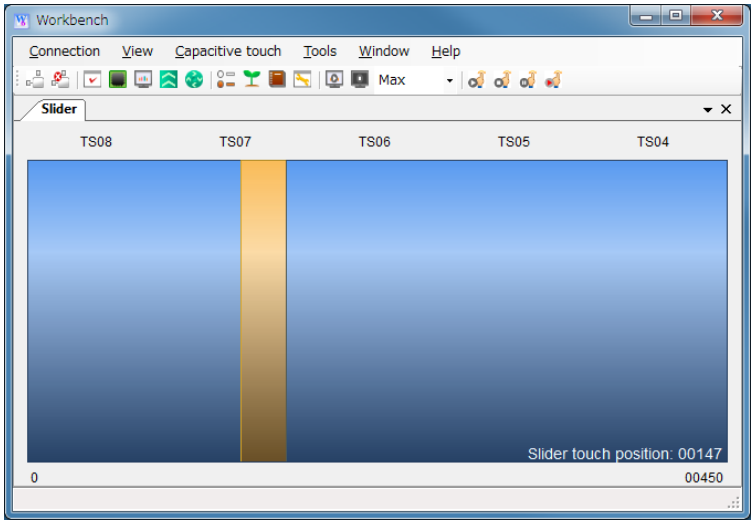
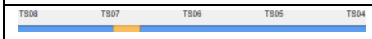


Figure 2-43 Slider monitor

	Shows slider touch position.
	Shows numerical value of slider touch position.
	Shows TS number composing a slider.
	Shows slider resolution.

(1) Context menu

(a) Slider select

Select a slider to monitor in Slider monitor.

(a) Display

- Touch position

  Shows and hides numerical value of slider touch position.
- Resolution

  Shows and hides slider resolution.
- TS number

  Shows and hides TS number composing a slider.

(b) Setup

- Horizontal

  Change slider image to horizontal.
- Vertical

  Change slider image to vertical.
- Forward order

  Change slider layout order of slider TS forward.
- Backward order

  Change slider layout order of slider backward.

(c) Close

Exit Slider monitor.

2.3.3 Wheel monitor

Wheel monitor displays wheel touch position in real time.

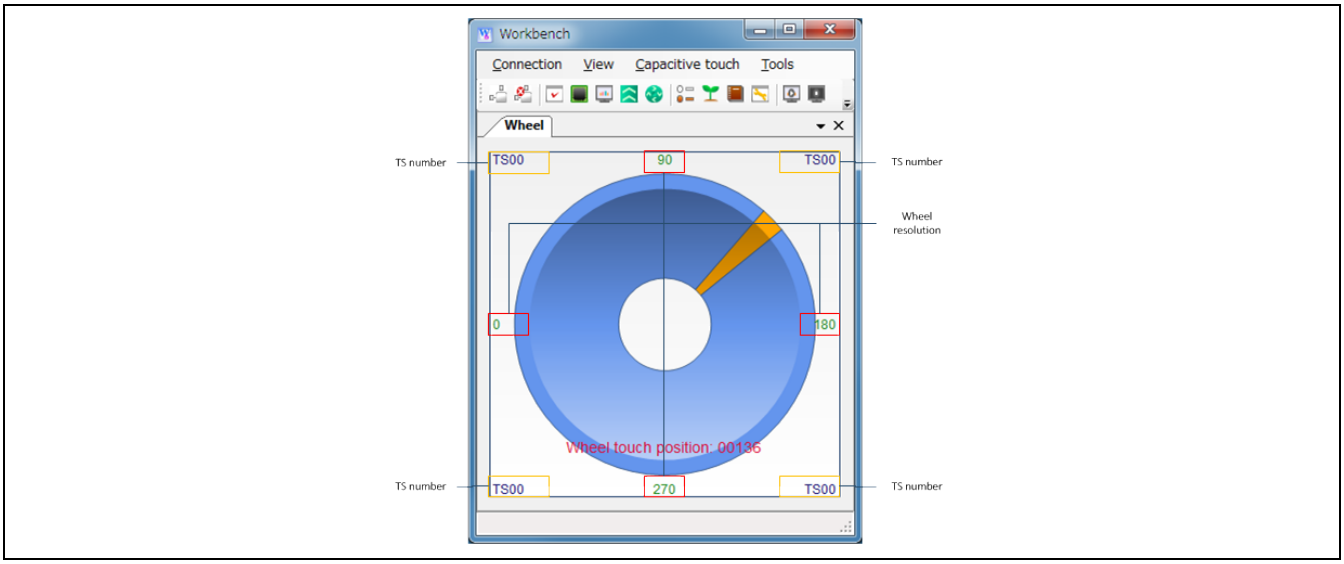
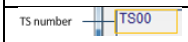
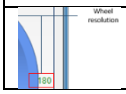


Figure 2-44 Wheel monitor

	Shows wheel touch position.
	Shows numerical value of wheel touch position.
	Shows TS number composing a wheel.
	Shows wheel resolution.

(1) Context menu

(a) Wheel select

Select a wheel to monitor in Wheel monitor.

(a) Display

- Touch position

  Shows and hides numerical value of wheel touch position.

- Resolution

  Shows and hides wheel resolution.

- TS number

  Shows and hides TS number composing a wheel.

(b) Setup

- Forward order

  Change the wheel layout order of wheel TS. When “Forward order” is checked, Wheel monitor changes the wheel layout order forward. When “Forward order” is not checked, Wheel monitor changes the layout wheel layout order backward.

- Rotate clockwise

  Rotate the start position of wheel TS clockwise

- Rotate counter-clockwise

  Rotate wheel TS start position counter-clockwise.

(c) Close

Exit Wheel monitor.

2.3.4 Difference monitor

Difference monitor displays count value difference in real time.

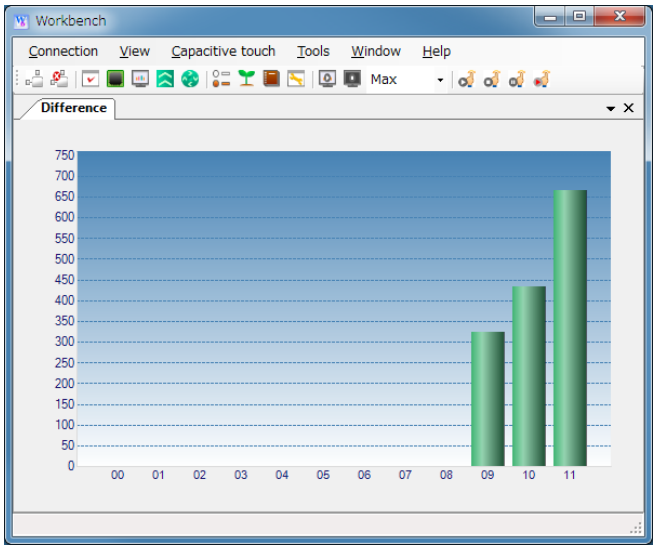
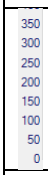
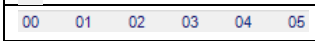


Figure 2-45 Difference monitor

	Shows count value difference. When TS is a part of slider or wheel, Difference monitor does not display reference value.
	Shows Y-axis value.
	Shows TS number.

(1) Context menu

(a) TS select

- Next channels

  Change TS numbers to monitor in Difference monitor according to following order.

  TS00 – TS11、TS12 – TS23、TS24 – TS35

- Previous channels

  Change TS number to monitor in Difference monitor in order of reverse of “Next channels”.

(a) Display

- Difference count value

  Shows and hides numerical value of difference count value.

- TS number

  Shows and hides TS number.

- Y-Axis

  Shows and hides Y-Axis.

(b) Close

Exit Difference monitor.

2.3.5 Locus monitor

Locus monitor displays slider touch position and wheel touch position in the form of line graph in real time.

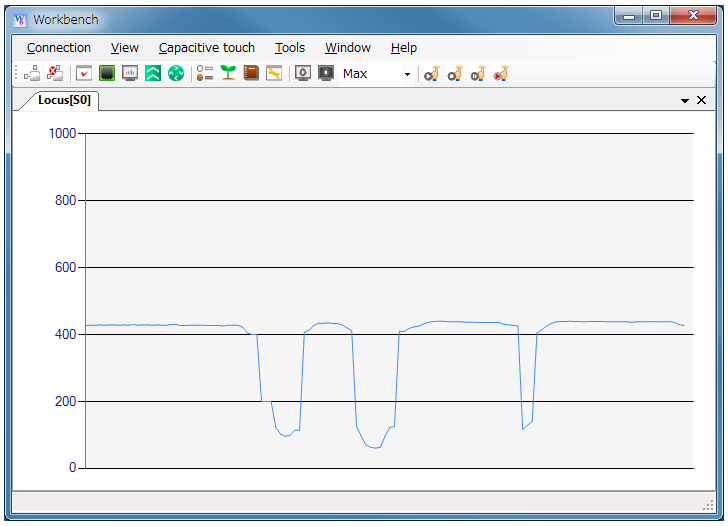
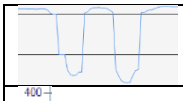
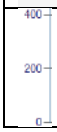


Figure 2-46 Locus monitor

	Shows slider touch position or wheel touch position.
	Shows the value of vertical axis of a slider touch position or wheel touch position

(1) Context menu

(a) Interface select

- Slider

  Select a slider to monitor in Locus monitor.

- Wheel

  Select a wheel to monitor in Locus monitor.

(a) Close

Exit Locus monitor.

2.3.6 Measurements

Measurements displays count value and reference value, threshold count value, result of judgment in real time.

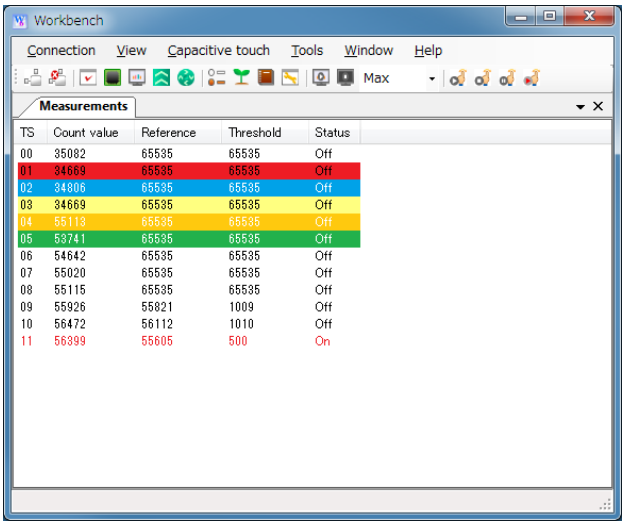


Figure 2-47 Measurements

TS 00	Shows TS number.
Count value 35082	Shows count value.
Reference 65535	Shows reference count value. When TS is a part of slider or wheel, Measurements displays 65535 as the “Reference count value”.
Threshold 65535	Show threshold count value. When TS is a part of slider or wheel, Measurements display 65535 as the “Threshold count value”.
Status Off	Shows result of the “Judgment process” as follows. Touch: On, Non-touch

(1) Context menu

(a) Status monitor

Start Status monitor with TS number selected in Measurements.

(b) Mark

- Red

  Mark a selected row with red color.

- Blue

  Mark a selected row with blue color.

- Yellow

  Mark a selected row with yellow color.

- Orange

  Mark a selected row with orange color.

- Green

  Mark a selected row with green color.

- Default

  Cancel marking of a selected row.

(c) Close

Exit the Measurements.

(2) Drag and drop

You can change TS number which the Status monitor is monitoring by drag and drop TS number selecting in the Measurements into the Status monitor.

2.3.7 Radar

Radar displays a result of judgment process in real time.

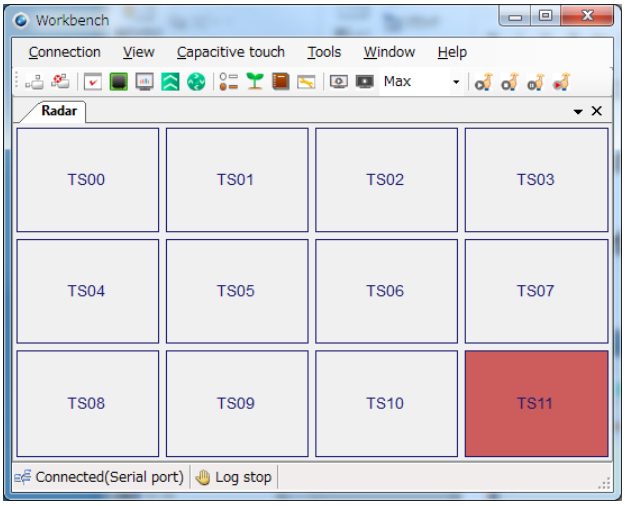


Figure 2-48 Radar

TS00	Shows result of judgment process is non-touch.
TS11	Shows result of judgment process is touch.

(1) Context menu

(a) Status monitor

Select a TS number to monitor in Status monitor.

(a) Mark

- Red

  Mark a selected row with red color.
- Blue

  Mark a selected row with blue color.
- Yellow

  Mark a selected row with yellow color.
- Orange

  Mark a selected row with orange color.
- Green

  Mark a selected row with green color.
- Default

  Cancel marking of a selected row.

(b) Setup

- TS00 – TS11

  Change TS numbers to monitor in Radar to TS00 - TS11.
- TS12 – TS23

  Change TS numbers to monitor in Radar to TS12 – TS23.
- TS24 – TS35

  Change TS numbers to monitor in Radar to TS24 – TS35.

(c) Close

Exit Radar.

(2) Drag and drop

You can change TS number which the Status monitor is monitoring by drag and drop TS number selecting in the Measurements into the Status monitor.

2.3.8 Parameters

Parameters can read and edit TouchAPI parameters.

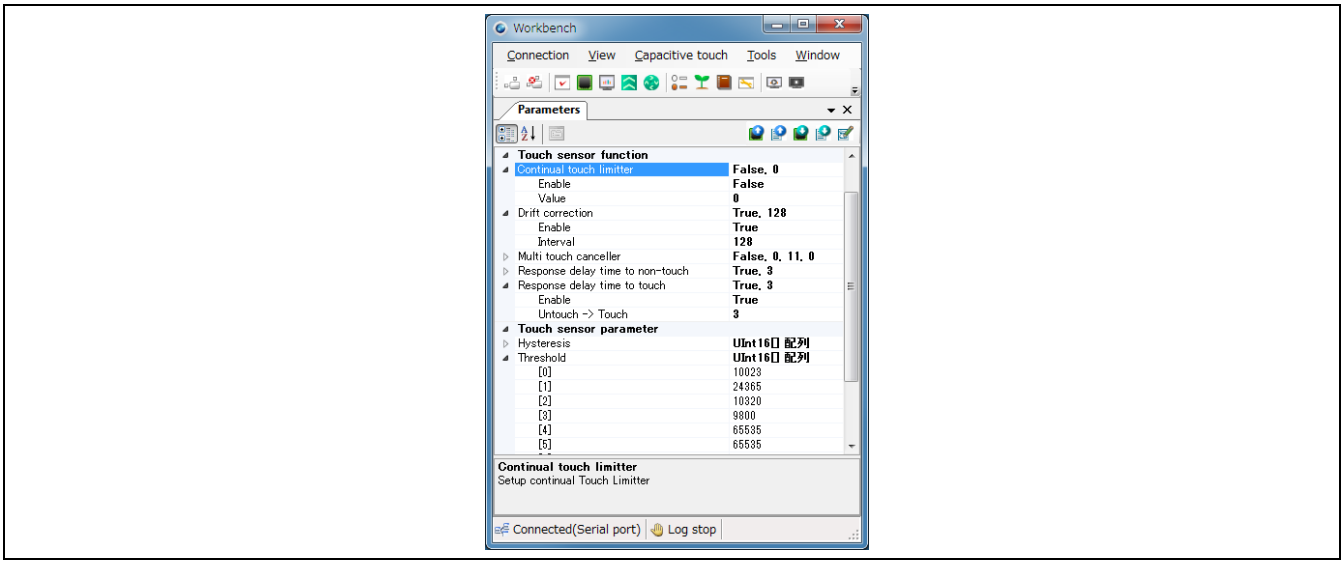


Figure 2-49 Parameters

	Reads TouchAPI parameters from target board.
	Reads TouchAPI parameters from parameter file. Select parameter file in “Open file” dialog that is displayed by press of this button.
	Writes TouchAPI parameters to target board.
	Writes TouchAPI parameters to parameter file. Select parameter file in “Save file” dialog that is displayed by press of this button.
	Writes TouchAPI parameters to TouchAPI source files. When “Folder browser” dialog is displayed, select a folder that TouchAPI project is stored.
	Shows “Description area” that explains about a selected Touch API parameter.

(1) TouchAPI parameters

(a) Drift correction

- Enable

  Enabling and disabling the Drift correction.

  True: enable, False: disable

- Interval

  Set interval time for the Drift correction.

(a) Continual touch limiter

- Enable

  Enabling and disabling the “Max successive ON count”.

  True: enable, False: disable

- Value

  Set the “execution interval time” for the “Max successive ON count”.

(b) Response delay time to touch

- Enable

  Enabling and disabling the “Judging count non-touch to touch”.

  True: enable, False: disable

- Non-touch -> Touch

  Set a value of “Judging count non-touch to touch”.

(c) Response delay time to non-touch

- Enable

  Enabling and disabling the “Judging count touch to non-touch”.

  True: enable, False: disable

- Touch -> Non-touch

  Set a value of “Judging count touch to non-touch”

(d) Multi touch canceller

- Enable

  Enabling and disabling the “Multi touch canceller”.

  True: enable, False: disable

- Start channel

  Set “Start TS number” that multi touch canceller effects.

- Stop channel

  Set the “Stop TS number” that multi touch canceller effects.

- Threshold

  Set the “Threshold” of the “Multi touch canceller”.

(e) Threshold

Set the “Threshold count value”. Number in “[]” shows TS number.

(f) Hysteresis

Set the “Hysteresis”. Number in “[ ]” shows TS number.

(g) Slider parameter

- Resolution

  Set the “Slider resolution”. Number in “[ ]” shows TS number.

- Threshold

  Set the “Slider threshold”. Number in “[ ]” shows TS number.

(h) Wheel parameter

- Resolution
- Set the “Wheel resolution”. Number in “[ ]” shows TS number.
- Threshold

  Set the “Wheel resolution”. Number in “[ ]” shows TS number.

(2) Context menu

(a) Read

- Read from target system

  Read TouchAPI parameters from target board.

- Read from parameter file

  Read TouchAPI parameters from parameter file. Select a parameter file in “Open file” dialog that is displayed by selection of this menu.

(a) Write

- Write to target system

  Write TouchAPI parameters to target board.

- Write to parameter file

  Write TouchAPI parameters to parameter file. Select a parameter file in “Save file” dialog that is displayed by selection of this menu.

- Write to Touch API

  Write TouchAPI parameters to TouchAPI source files. When “Folder browser” dialog is displayed, select a folder that TouchAPI project is stored.

(b) Initialize

Initialize TouchAPI parameters.

(c) Auto update

Enabling and disabling automatic update of Touch API parameters.

(d) Display description

Shows and hides the “Description area”.

(e) Close

Exit Parameters.

2.3.9 Registers

Registers can read and edit TouchAPI registers.

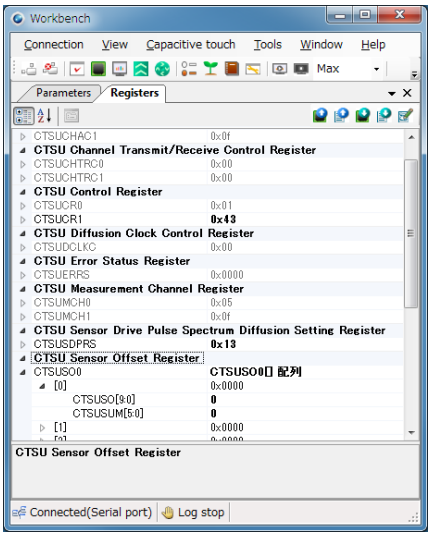
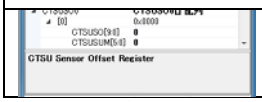


Figure 2-50 Registers

	Reads TouchAPI registers from target board.
	Reads TouchAPI registers from parameter file. Select register file in “Open file” dialog that is displayed by press of this button.
	Writes TouchAPI registers to target board.
	Writes TouchAPI registers to register file. Select register file in “Save file” dialog that is displayed by press of this button.
	Writes TouchAPI registers to TouchAPI source files. When “Folder browser” dialog is displayed, select a folder that TouchAPI project is stored.
	Shows “Description area” that explains about a selected Touch API register.

(1) TouchAPI registers

(a) CTSUCR0

- CTSUSTRT

  Show “CTSU Measurement Operation Start”.

  Stop: Measurement operation stops, Start: Measurement operation starts

- CTSUCAP

  Show “CTSU Measurement Operation Start Trigger Select”.

  SoftwareTrigger: Software trigger, ExternalTrigger: External trigger

- CTSUSNZ

  Show “CTSU Wait State Power-Saving Enable”.

  Disable: Power-saving function during wait state is disabled

  Enable: Power-saving function during wait state is enabled

- CTSUIOC

  Show “CTSU Transmit Pin Control”.

  Low: Low-level output from transmit channel non-measurement pin

  High: High-level output from transmit channel non-measurement pin

- CTSUINIT

  Show “CTSU Control Block Initialization”.

  This value is always “Off”.

(a) CTSUCR1

- CTSUPON

  Show “CTSU Power Supply Enable”.

  Off: Powered off

  On: Powered on

- CTSUSCW

  Show “CTSU LPF Capacitance Charging Control”.

  Off: Capacitance switch turned off, On: Capacitance switch turned on

- CTSUATUNE0

  Show “CTSU LPF Capacitance Charging Control”.

  NormalOperation: Normal operating mode

  LowVoltage: Low-voltage operating mode

- CTSUATUNE1

  Show “CTSU Power Supply Capacity Adjustment”.

  NormalOutput: Normal output, HighCurrentOutput: High-current output

- CTSUCLK

  Show “CTSU Operating Clock Select”.

  PCLK: PCLK、LPCLKdividedBy2: KCLK/2、PCLKdividedBy4: CKLK/4

- CTSUMD

  Show “CTSU Measurement Mode Select“.

  SelfCapacitanceSingleScan: Self-capacitance single scan mode

  SelfCapacitanceMultiScan: Self-capacitance multi-scan mode

  MutualCapcitanceSimpleScan: Mutual capacitance simple scan mode

  MutualCapcitanceFullScan: Mutual capacitance full scan mode

(b) CTSUSDPRS

- CTSUPRRATIO

  Show “CTSU Measurement Time and Pulse Count Adjustment CTSU”.

- CTSUPRMODE

  Show “CTSU Base Period and Pulse Count Setting”.

  Pulse510: 510 pulses, Pulse126: 126 pulses, Pulse62: 62 pulses

- CTSUSOFF

  Show “CTSU High-Pass Noise Reduction Function Off Setting”.

  Off: High-pass noise reduction function turned on, Off: High-pass noise reduction function turned off

(c) CTSUSST

- CTSUSST
- Show “CTSU Sensor Stabilization Wait Control”.

(d) CTSUMCH0

- CTSUMCH0

  Show “CTSU Measurement Channel 0”.

  CTSUTS0: TS0、CTSUTS1: TS1、CTSUST2: TS2、…

(e) CTSUMCH1

- CTSUMCH1

  Show “CTSU Measurement Channel 1”.

  CTSUTS0: TS0、CTSUTS1: TS1、CTSUST2: TS2、…

(f) CTSUCHAC0

- CTSUCHAC0

  Show “CTSU Channel Enable Control 0”.

  GPIO: Not measurement target, CapacitiveTouch: Measurement target

(g) CTSUCHAC1

- CTSUCHAC1

  Show “CTSU Channel Enable Control 1”.

  GPIO: Not measurement target, CapacitiveTouch: Measurement target

(h) CTSUCHTRC0

- CTSUCHTRC0

  Show “CTSU Channel Transmit/Receive Control 0”.

Receive: Reception, Transmit: Transmission

(i) CTSUCHTRC1

- CTSUCHTRC1

  Show “CTSU Channel Transmit/Receive Control 1”.

  Receive: Reception, Transmit: Transmission

(j) CTSUDCLKC

- CTSUSSMOD

  Show “CTSU Diffusion Clock Mode Select”.

- CTSUCCCNT

  Show “CTSU Diffusion Clock Control”.

(k) CTSUST

- CTSUSTC

  Show “CTSU Measurement Status Counter”.

  Status0: Status0、Status1: Status1、Status2: Status2、Status3: Status3、Status4: Status4、Status5: Status5

- CTSUDTSR

  Show “CTSU Data Transfer Status Flag”.

  False: Measurement result has been read, True: “Measurement result has not been read”

- CTSUSOVF

  Show “CTSU Sensor Counter Overflow Flag”.

  True: No overflow, False: An overflow

- CTSUROVF

  Show “CTSU Reference Counter Overflow Flag”.

  True: No overflow, False: An overflow

- CTSUPS

  Show “CTSU Mutual Capacitance Status Flag”.

  First: First measurement,Second: Second measurement

(l) CTSUSSC

- CTSUSSDIV

  Show “CTSU Spectrum Diffusion Frequency Division Setting”.

  DivideBy1: Divided by 1, DivideBy2: Divided by 2, DivideBy3: Divided by 3, -, DiviceBy16: Divided by 16

(m) CTSUSO0

- CTSUSO

  Show “CTSU Sensor Offset Adjustment”.

- CTSUSNUM

  Show “CTSU Measurement Count Setting”

(n) CTSUSO1

- CTSURICOA

Show “CTSU Reference ICO Current Adjustment”.

- CTSUSDPA

  Show “CTSU Base Clock Setting”.

  DivideBy2: Operating clock divided by 2、DivideBy4: Operating clock divided by 4、DivideBy6: Operating clock divided by 6, - - - DiviceBy64: Operating clock divided by 64

- CTSUICOG

  Show “CTSU ICO Gain Adjustment”.

  Gain100: 100% gain, Gain66: 66% gain, Gain50: 50% gain, Gain40: 40% gain

(o) CTSUERRS

- CTSUICOMP

  Shows “TSCAP Voltage Error Monitor”

  Normal: Normal TSCAP voltage, Abnormal: Abnormal TSCAP voltage,

(2) Context menu

(a) Read

- Read from target system

  Read TouchAPI registers from target board.

- Read from register file

  Read TouchAPI registers from register file. Select a register file in “Open file” dialog that is displayed by selection of this menu.

(b) Write

- Write to target system

  Write TouchAPI registers to target board.

- Write to register file

  Write TouchAPI registers to register file. Select a register file in “Save file” dialog that is displayed by selection of this menu.

- Write to Touch API

  Write TouchAPI registers to TouchAPI source files. When “Folder browser” dialog is displayed, select a folder that TouchAPI project is stored.

(c) Initialize

Initialize TouchAPI registers.

(d) Auto update

Enabling and disabling automatic update of Touch API parameters.

(e) Display description

Shows and hides the “Description area”

(f) Close

Exit Registers.

2.4 Adjustment guide

Workbench does not support this function now.

2.5 Source code gallery

Workbench does not support this function now.

2.6 Document manager

Document manager can read and search documents about touch sensor.

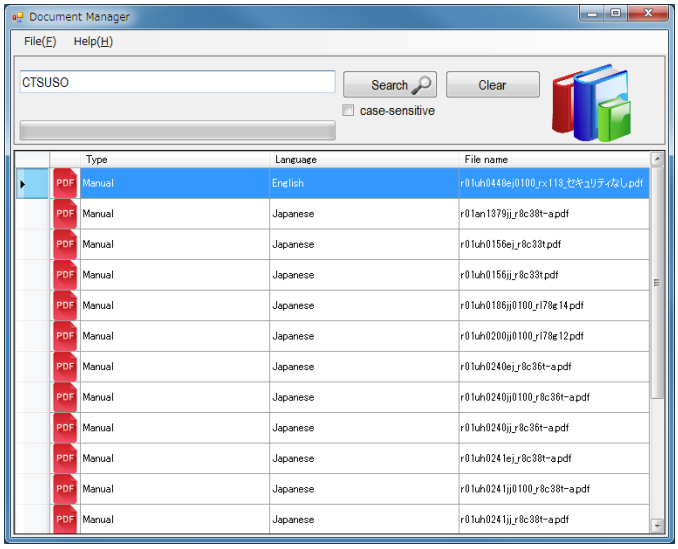


Figure 2-51 Document manager

	Input keyword to search.
Search	Start searching keyword.
Stop	Stop searching keyword.
Clear	Clear result of searching keyword.
case-sensitive	Enabling and disabling cache for searching keyword.
	Show progress of searching keyword.

2.6.1 Menu

(1) File

- Exit

  Exit Document manager.

(2) Help

- About Document manager

  Display Document manager version information.

3. FAQ

3.1 First step guide displays “Could not load or assembly ‘ISWrapper.dll’ or one of its dependencies” in “Target board startup”

Install Visual studio 2012 Run-time library for 32 bit to your PC. Even if you use 64 bit OS, you must install the Visual studio run-time library for 32 bit.

3.2 Status monitor does not display the Reference value and the Threshold count value.

When TS is a part of slider or wheel, Status monitor does not display threshold count value.

4. Note

4.1 Caution in use of CS+

4.1.1 Enabling IronPython Console Plug-in

Press menu [Tool] – [Plug-in Setting] to start the Plug-in Manager and enable “IronPython Console Plug-in”.

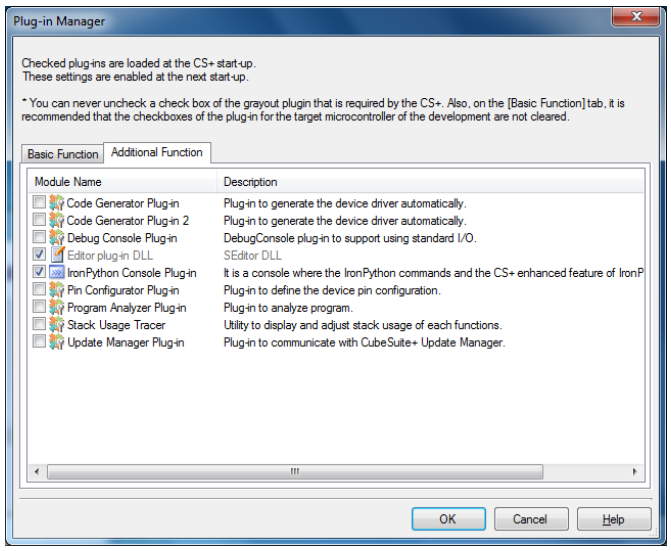

Plug-in Manager
Checked plug-ins are loaded at the CS+ start-up.
These settings are enabled at the next start-up.
* You can never uncheck a check box of the grayout plugin that is required by the CS+. Also, on the [Basic Function] tab, it is recommended that the checkboxes of the plug-in for the target microcontroller of the development are not cleared.
Basic Function
Additional Function
Module Name
Description
Code Generator Plug-in
Plug-in to generate the device driver automatically.
Code Generator Plug-in 2
Plug-in to generate the device driver automatically.
Debug Console Plug-in
DebugConsole plug-in to support using standard I/O.
Editor plug-in DLL
SEditor DLL
IronPython Console Plug-in
It is a console where the IronPython commands and the CS+ enhanced feature of IronP
Pin Configurator Plug-in
Plug-in to define the device pin configuration.
Program Analyzer Plug-in
Plug-in to analyze program.
Stack Usage Tracer
Utility to display and adjust stack usage of each functions.
Update Manager Plug-in
Plug-in to communicate with CubeSuite+ Update Manager.
OK
Cancel
Help

Figure 4-1 Plug-in Manager

4.2 Caution in use of e2 studio

4.2.1 First step guide does not reply to your operation in “Target board startup”

When the model number of the microcomputer on target board does not accord with the model number of the microcomputer which you chose, "Target board startup" may not reply to your operation.

Please terminate e2 studio in this case.

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		Description	
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